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New Zealand Geographer

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OF MANY THINGS*

GEORGE JOBBERNS

> 'The time has come,' the Walrus said,
> 'To talk of many things,
> Of shoes—and ships and—sealing wax—
> Of cabbages—and—kings—
> And why the sea is boiling hot—
> And whether pigs have wings.'

IT IS THE privilege of the president on a formal occasion like this to speak on anything at all that may seem to him appropriate. Whether his audience be interested or not, he can be reasonably sure that they will listen patiently and pass him a polite vote of thanks. It is not the custom to argue with him. Tonight I will speak of many things, for this is not only the Presidential Address to the Canterbury Branch of the New Zealand Geographical Society. This meeting is timed to coincide with the second triennial conference of the society and a teachers' refresher course sponsored by the Department of Education. So I speak also as President of the Conference. Most of us are teachers of geography and I will crave the patient indulgence of those of you who are layman members of the society while I talk shop to my fellow teachers. But I would remind my academic colleagues, especially those of us who are entitled professors of geography, that we have no proprietary rights in geographical knowledge; many laymen of many kinds have contributed as much or more to it than most of us. I will range pretty widely over the field of academic geography and our making and teaching of it, so there may well be some points at which all of us here may find some common interest.

I will first take a look at geography in the teachers' colleges, for here we nurtured it until we got the university to sponsor it some twenty years ago. Geography is, of course, as old as man's first curiosity about the world around him; but there are some who seem to think we did not really know what it is until Richard Hartshorne's *The Nature of Geography* was published in 1939. This is a very fine contribution to the methodology of geography, but you must not take it as a sort of testament of revealed truth, and a chart of the only way to it. Professor Hartshorne, himself, would not want you to do anything like this.

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*The Presidential Address delivered to the Second New Zealand Geography Conference at Christchurch on 28 August 1958.

At Christchurch Teachers' College

We had good scholarly geography in the Christchurch Teachers' College when I went there as a student in 1914 and heard C. T. Aschman, then headmaster of the Normal School, lecture to the impressionable young on physical geography. He was in his heyday an incomparable teacher, and his lectures on the simple and obvious things in the landscape about us were given with a rare verve and sparkle. This was no dry-as-dust course on physical geography; with him we looked at the land and the sea, the sky and the air and running water; lifted our eyes to the hills and caught something of the feeling of the poet for the processes of nature. Whether or not your student is roused to a lasting interest in your subject depends a lot on how you give it to him in his first year.

In those days life in teachers' colleges went at a more placid pace than now. The recruit to teaching would start in a primary school as a pupil-teacher and be expected at the end of a couple of years to have passed the examinations for his D Certificate. In the teachers' college his standard course of two more years for his C Certificate would embrace English, Education, History, Agriculture and Physiography. The college course was not too cluttered up. This physiography covered what has long been conventionally regarded as the field of physical geography, namely, the earth as a planet, the atmosphere, the ocean, the land (that is, the physical landscape in evolution)—a good solid, exacting course of study in keeping with the tradition of the time. At least half the course of practical work was by regulation required to be spent in the field.

Any student of promise was encouraged to take a university degree course at Canterbury University College, enabling many of us to get university education that otherwise would have been denied us. I mention this now only to take the opportunity to say that to me it has since been a satisfaction and a pleasure to do anything to help along the part-time student from the teachers' college or anywhere else, so long as he has been ready to work to the limit of his capacity. Some of my most able graduates have come through the hard way as part-time students.

1922: Physical Geography

It was after a somewhat precariously discontinuous course in geology that I was back in the Christchurch Teachers' College in 1922 as Lecturer in Physiography—back to the teaching of physical geography to teachers in training. Through the 1920's of happy memory we were not so tightly regimented by the Department of Education. Closing on the first Friday in December, and resuming on the last Monday in February, we had a reasonably long and leisurely summer vacation. For me this was the opportunity for a lot of steady fieldwork in geomorphology, newly enlightened and enlivened by Professor C. A. Cotton's classic papers and, especially, by his book setting out so fully and lucidly W. M. Davis's system of explanatory description of landforms. I, too, became a disciple of Davis, and I suppose it was natural enough, too, that at this time I got a good deal in the way of inspiration from the work of J. W. Gregory; but of this all I want to say now is that it was this active work in the field that enlivened and enlightened my own teaching of physical geography. All in all, the teachers' college of the 1920's was a very pleasant and satisfying place in which to work.

If, after almost fifty years of experience, I have any specially fixed and firm belief about teaching, it is that the teacher will teach fully only out of the fullness of his own knowledge of his subject. Unhappily here is where I came to conflict of opinion with a former Director of Education who was a more or less regular visitor. He would chide me with being concerned too much with 'content' and too little with 'method'; my function was to teach the young people how to teach. I would argue that, very well as this might be, I had first to give them something to teach. All I would say about this now is that his is an outlook and attitude discouraging to the flowering of true scholarship; and that a teaching institution that does not give opportunity and encouragement for the full maturing and mellowing of scholarship as such stultifies itself.

Like most of my colleagues in the teachers' college of my time, I came inevitably to another point of frustration. This is a very serious matter indeed. Professionally the teachers' college lecturer in New Zealand has become a sort of forgotten man. The salary may entice the really first-class young man of ability, enterprise and ambition into the college as a lecturer but is not enough to keep him there. Inevitably the time will come when he has to get out to get on; and it is the misfortune of some of our best to enter so early and stay so long that there seems no adequate other place in the teaching service for them to go. The teachers' colleges will not hold up their heads and look the scholarly world in the eye until the basis of reward for its lecturing staff in the academic subjects is overhauled. Its service should be made attractive to the best of our young scholarly people so that they could make teachers' college service a career and bring their own gifts of scholarship and personality to full flowering within the college itself. This would lift up its reputation and status in the academic world immeasurably.

There is more in this, too, than the matter of money. A scholar will only keep himself up to or ahead of his subject if he has time and opportunity and some leisure to work at it himself. The old-time leisurely summer vacation of the 1920's gave him something of this; but the dull grind of repeating the same lectures to little groups up to half a dozen or more times a week, as some do now, would surely take it all away again. I have urged several of my brighter young men into teachers' college service, but could not find it in me to blame them when they quit.

1928: Environmentalism

But this has been by way of a digression. The teachers' colleges did a good service to our academic geography in nurturing it and leading the university to seeing the need for raising its status. In 1928 the primary schools curricula were revised and the field of geography therein enlarged. It seems to be fashionable to criticise the syllabus in geography set out in the well known 'red book' because it was rather highly coloured by the 'doctrine of determinism'. I criticised it myself in my time in a superior sort of way. The makers of the syllabus seem to have been carried away by the ideas of Ellen Churchill Semple and her followers. But I see now that Ellen Semple was a far more competent geographer than many of us moderns. Who of us, for example, nurtured wholly in geography as such, could have written her account of the Mediterranean world of antiquity, coloured and all as it may be by what we call determinism? To her it came out of a profound *classical* scholarship.

So, preparing teachers for service in the schools, we moulded our teaching of them to the needs of the new syllabus. Meantime the university teachers of geology were spasmodically offering a beginning course to first-year students; by the mid-1930's the university calendar contained a statement of a full B.A. degree course of three years. In formulation of this Professor W. N. Benson was most directly responsible, and it followed pretty closely the ideas of Griffith Taylor whom he held in high regard.

At Canterbury University College

This was the situation of academic geography up to 1934 when all the teachers' colleges were closed as a measure of depression economy. To keep me in some kind of employment I was informally attached to the Department of Geology at Canterbury College. There, by a mutually friendly arrangement with Dr R. S. Allan, I taught a group of students a full year's Stage I course in geography as prescribed in the university calendar. Back again in the Christchurch Teachers' College I took similar courses for Stage I students as a part-time lecturer through 1935 and 1936, many of my Canterbury College students coming from my classes in the teachers' college. This again was in association with Dr Allan's Department of Geology. Closely interested in all this at the time were three members of the Council of the Canterbury University College: Messrs C. T. Aschman, its Chairman, J. G. Polson, Principal of the Teachers' College, and Professor James Hight, Rector of Canterbury University College. To these, especially the first named, the initial foundation of the independent Department of Geography is mainly due. I think gratefully of the formal and official founder of my Canterbury College department as being C. T. Aschman who first roused me to interest in physical geography in the Christchurch Teachers' College in 1914. Thus I would put on record an account of the beginnings of academic geography in the university of New Zealand. But I would not have you think that we did not have substantial teaching of geography till 1937; this recognition of it by the university was but a recognition of the work we had done so long in the teachers' colleges. These were the nurseries of academic geography in New Zealand.

So in 1937 geography was set up on its own feet in the University of New Zealand. Out of geology I had become a geographer because I was now so entitled. Isaiah Bowman, who had come into geography by a similar route, once called me 'a geographer by declaration'. Now I set out to comb the academic world for the best that it had in the way of ideas and outlooks and literature in geography as such. We struggled through 1938 with a group of second-year undergraduate students nurtured on the material prescribed in the syllabus of the time. Hearing that Professor Frank Debenham of the University of Cambridge was to visit Australia in October 1937, I went to Sydney to talk geography with him and Professor J. Macdonald Holmes, then the only professor of geography in this part of the world. This was a very rewarding experience; indeed the evolution of our geography owes much to Professor Holmes who for many years was the external examiner of our advanced students. I would venture to suggest that the works of no professor of geography have been more assiduously and closely studied by our students. He was a very good examiner, quick and sure to find any student with more than ordinary promise and ability. This is surely the main purpose of any formal examination; the system, too, was very simple and convenient and in this respect much better than the cumbersome internal-external method now in vogue.

Beginnings of Oversea Influences

At this time we were singularly fortunate, for through the kindly offices of Dr R. O. Buchanan, an expatriate New Zealander since become Professor of Geography in the University of London, we got K. B. Cumberland as Lecturer in Geography. One of the ablest of the crop of young English graduates, he joined us in May 1938.

Then in 1939, on the eve of the war in Europe, I had an opportunity to visit the United States, primarily as a visiting student of geomorphology at Columbia University by invitation of Professor Douglas Johnson, and financed by a grant from the Carnegie Corporation of New York. He had suggested this visit back in 1935 after he had been official examiner of the thesis I had submitted for the D.Sc. degree of the University of New Zealand. In the Teachers' College of the time, I could not induce the Department of Education to let me have a few weeks leave on salary to let me go for the fall semester. The director was sympathetic enough, but all he seemed able to do was to tell me, 'there is nothing in the regulations to provide for anything like this'.

I put this on record now to take the opportunity to express in some quite inadequate way my personal debt of gratitude to a host of friendly and incredibly hospitable people in the United States. For me this was the best and most rewarding experience that has come my way. I went about the country with the curiosity of a child, and professional geographers everywhere were ready to help with everything they had. Association with Douglas Johnson at Columbia was a special inspiration, and a special privilege it was to join his Saturday morning seminar in geomorphology. Here his students got a quite remarkable training in clarity of thinking and precision of statement. The last occasion of our meeting was at Clark University in March 1940 where he delivered a lecture on the subject of the Carolina bays. It was a model exposition of his scientific method. This happy experience of his seminars led me to the introduction of this method of teaching in the advanced classes in my department, where it has been in vogue ever since.

American Visiting Lecturers

Another singularly happy and profitable idea arising out of this visit to the United States was the bringing to Canterbury University College of a succession of visiting lecturers. The first two came from the University of California at Berkeley before the dislocation of everything by the war. Since the war we have had an almost continuous flow of visitors, mostly keen young scholars with a diversity of background and training, bringing us into personal contact with some of the leading university centres of academic geography in the United States. We have had them from the University of California both at Berkeley and Los Angeles, and the Universities of Washington, Nebraska and Harvard. Some of our own young men in turn have gone to graduate schools in various American universities.

It seems not to have been so easy to attract scholars from England as visitors. Professor R. O. Buchanan himself held the post in 1948, thus affording him an opportunity of brief return to his native country. A very special pleasure to us and a potent stimulus to those of our students who could measure up to her exacting standards was the visit of Dr Cuchlaine King from the University of Nottingham. Herself a graduate of Cambridge she reminded us of the virtue of research in the field of geomorphology in the English tradition. She would not be involved in disputation about what is or what is not geography. Pursuing her own research for the sake of knowledge itself she would not seem unduly concerned whether it would lead her in or out of what our methodologists would think to be geography. She brought us a stimulating and wholesome vision of the scholar's urge to pursue knowledge for its own sake wherever the pursuit might lead.

Another visiting lecturer of rare intellectual quality was Donald Patton who, coming from Harvard, brought us something of the outlook and philosophy of that great and liberal scholar Derwent Whittlesey. Andrew Clark, too, from the University of California at Berkeley, brought us a new vision of historical geography and applied his methods and ideas in a stimulating study of the European settlement of this country. It would be quite fair for me to say that the getting of such brilliant young scholars has been one of the most rewarding investments our University of Canterbury has made.

Meantime our own graduates were coming on into this stimulating world of developing ideas on academic geography. I would but hope that the intellectual climate in which they were nurtured has been a liberal one, that no thought has ever been given to the casting of them all in any one mould, and that every one of them has been encouraged to follow as far as in him lay the line of his own peculiar aptitude and interest. Several have found a niche in university work abroad and those of them who are now on the staff of our own department have been mellowed and matured by university experience in England or America. From this they bring us something as diverse as the air of Wisconsin, of University College, London, of Nottingham, and of the more rarified and urbane atmosphere of Oxford itself. With this diversity of their background and experience none of us in Canterbury should fall into the error of thinking that there is only one truth to seek in geography or any one way to it.

IN OTHER UNIVERSITY COLLEGES

Around 1945 academic geography in the University of New Zealand proliferated with the founding of new departments in Auckland and Dunedin, to be followed a little later by Wellington. We are all loosely tied to a similar general pattern of courses for the Arts and Science degrees, and a rather clumsy and sometimes irritating system of internal-external examining serves to see that standards of degree awards are kept to some reasonable uniformity of level. But beyond this I would hope we never go towards uniformity. Just as I would have the student follow the line of his own special aptitude and interest so I would have our various university departments do. This is something of the essence of academic freedom. Here I would pause to applaud Professor S. W. Wooldridge[1] when he says:

> But nothing in my own experience inclines me to constrain colleagues or students to a rigid uniformity of outlook. And if other University Schools prefer different emphases, though I may nurture in my secret heart the hope that it is *they* who are deluded, I am well aware that they will naturally reciprocate the feeling and I shall be led to ponder the virtues of tolerance.

So I will leave the record of our making of academic geography in New Zealand; it is now in many hands other than mine. I will pass on to matters of closer concern to our teachers of geography in the schools.

Geography in Schools

It seems always to have been the fate of the schoolmaster to be judged by his success in getting his pupils through the public examinations. So in what I have to say about the teaching of geography in our schools please do not think that I am out to castigate the teachers; rather I am commenting on some effects of the system in which they work. A few years back it was fashionable to think of the University of New Zealand as a great black shadow over our schooling system, dominating all by its public examination for entrance. This examination was something of an accepted standard of achievement, serving many purposes other than a measure of fitness to enter the university. Then authority to accredit was given to approved schools, and the public entrance examination remained only for those failing to be accredited or attending the many smaller schools not on the 'approved' list. The price of this liberal measure was acceptance of the School Certificate examination, and the net result of it all is that pupils and teachers alike are out of the frying pan of the university into the fire of the Department of Education. Unfortunately the entrance standard, by accrediting or by examination, still serves as a measuring rod for all sorts of things other than entry to the university, and pupils, without any possible prospect of passing it, enter for it in something of the venturesome spirit of an investor in a Tattersall's lottery. Success will bring them something of a wage lift on entry to various sorts of occupation. So university teachers who read the scripts annually can expect a lot of very poor stuff, and they should be less prone to castigate the school teachers for inadequate teaching than some seem to be. This examining is their duty; the candidates' fees are a substantial part of university income. They should accept the duty with more humility and understanding than that panel of teachers, for example, who, reporting on the examination in English for 1957, say that only a small minority of the candidates were worth 'a moment of the time of any university teacher'. This, I think, is an attitude unworthy of any sort of teacher.

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[1] S. W. Wooldridge: *The Geographer as Scientist*, London 1956, p. 21.

A view that I have from time to time expressed is that we could well save ourselves a vast lot of trouble by abolishing the entrance examination entirely and throwing the university open to any young person who has reached the age of eighteen and completed a Form VIa course in a secondary school. I believe the annual pressure of entrants on the university would not be any greater than now, and if many failed to cope with their first year they could but leave without having brought any harm to themselves or the university. I suspect, however, that there are school teachers who would scarcely welcome the freedom such a course would give them; some seem to like their syllabus nicely and narrowly defined. On the other hand it has to be admitted that formal examinations are very useful practical incentives to keep the pupils working to capacity.

School Certificate Geography

The School Certificate examination, however, has grown to gigantic proportions and marking the scripts is, of necessity, reduced to something as nearly mechanical as can be devised. Examiners operate in big teams, and the papers must be framed so that in the reading of them the many examiners can get somewhere near to a uniform level of minimum requirement for a pass. This sort of mass examination will inevitably tend towards a stylised type of factual knowledge test. The teacher, thinking he will be judged by how many of his pupils get by, will tend as inevitably to divide knowledge into that which is useful and that which is not. If any of you would doubt this, look at the preface to a recently-published booklet, where the author quite frankly and naturally states, 'in the sections on Anglo-America and the British Isles, there are no notes on several regions not considered worthy of study at the School Certificate level.'[2] His goal is not so much to teach a good full course on the geography of Anglo-America and the British Isles as to get his pupils through the examination; but with the examination as it is this is the sort of attitude we might naturally enough expect. The system is such that it is on the examination that he sets his sights; in my younger days as a schoolmaster wanting to get on I would no doubt have done it myself. But it is a complete negation of anything scholarly in the approach to the teaching of school geography. This sort of thing is not confined to school geography; currently available to teachers with their sights on the School Certificate examination are boiled-down notes and a wide range of reprinted examination questions in history and language.[3] This is something akin to the presentation to the young of the 'pre-chewed classics' that Mortimer Smith[4] so vigorously protests against.

RESTRICTED SCOPE AND INTEREST

The only comment I would make on your School Certificate syllabus in geography (which is the main core and substance of our mass teaching of the subject) is that it takes a too myopic view of bits and pieces of the world. In this age of revolution in technology and society, we *must* give our young people, the future citizenry, a wider knowledge of the world at large. With David Linton, in his provocative address to the annual conference of the Geographical Association in 1957, I would ask you this simple question: 'Of how many secondary schools can it be said that every boy or girl leaves with a clear picture of the world as it is today?' With him I would agree that 'nothing less must be the aim if the subject is to serve mankind as it should'.[5] I will leave this question with you for your more leisurely consideration, and merely make the comment that we seem here (as apparently also in England) to be overmuch obsessed with regional geography. Well as it may be to divide our own country, Australia, the adjacent Pacific islands, Great Britain and Anglo-America into 'regions' for convenience of memorising assorted (and examinable) information about them, this is not enough. Indeed I cannot escape some feeling of fear that 'regional' geography in our schools has become something of a blight; so much of what we hand on in its name is to me what Mortimer Smith would call a tasteless mash.[6] In the annual examinations (at least in university entrance) we get far too much parrot-like repetition from the mash; sure proof that a lot of what we teach cannot be much in the way of intellectual stimulus to the young.

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[2] J. U. Macaulay: *School Certificate Geography Notes*, Auckland, 1957.

[3] See *Post-Primary Teachers' Journal*, August 1958.

[4] See *Time* (Pacific Edition), 7 July 1958, p. 44.

[5] D. L. Linton: 'Geography and the Social Revolution', *Geography*, Vol. 42, Pt. 1, January 1957, pp. 13–24.

The idea of giving our future citizens a knowledge of the Pacific world is a good one, but it seems to me that, in confining the compulsory part of our study to New Zealand, Australia and the associated island territories, we concentrate our interest on the wrong part of it. It is rather the Pacific borderlands about and north of the equator that will make the world of our future. To neglect these as we do is likely to make of us all a nation of ostriches with very short memories.

As a people we are dedicated to giving all our youth entry into the secondary schools. Many of you, there engaged in taking beginning courses in the social studies, and seeing the virtue of having these well-founded in geography and in history, should have freer and fuller scope for what enterprise and imagination you have. You should not find yourselves so tightly tied to the public examinations. And those of you with imagination enough could well try to do something special for those who will stay with you only till they can legally leave at fifteen. These are worth more than a moment of your time; as part of the urban masses of the future they will need all you can give them.

Geography in Universities

Here I will end my sermon to those of my fellow teachers who are in the schools, and address a few comments to my colleagues in the universities. The last thing I would want to do is to stand before you as one who knows all about geography, but there are some things I am moved to say and this seems to be the time to say them. More or less fortuitous circumstances that I have already described led to my becoming entitled a professor of geography; not trained in any particular school I can stand aside and take a more or less detached look at your academic world. What I would especially look at is your research.

For teachers in the universities research is essential. You *must* do some if you are to keep yourselves and your subject alive. There should be no need for me to tell you this; nor to tell you that you will often

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[6] *loc. cit.*

hear more talking about research than see the doing of it. There are many sorts of researchers with many sorts of motivating urges. The member of the big team working on a segment of an organised project as his nine-to-five job would, I should think, be likely to get the least satisfaction from it. By contrast is the born researcher, so full of curiosity about everything around him, that he will always be well out on the way to the borderland of knowledge in the field of his especial interest. There are not many of these around; and they do not seem to come our way. In twenty years I have had but two students I would without hesitation put in this category; both now work outside the field of geography.

Between these two extremes you can think of diverse sorts of categories of researchers: especially the earnest young academic who finds he has to do something to get his Ph.D. degree, for this to him is a sort of union ticket to higher places. Well for him and for us if, in the getting of the degree, he is roused to a real urge to knowledge for its own sake, but rather pathetic if to him the Ph.D. when got means that with Stephen Leacock he can say, 'with respect to knowledge I may now be pronounced full'.

THE FIELD OF GEOGRAPHY

But I am digressing again. I get back to asking what is the field of our enquiry in geography. Here I find myself standing beside Carl Sauer[7] in his belief:

> It is neither necessary nor desirable that we consider the totality of region as the common basis of geographic study. Individual interest and competence begins and may remain with specific elements of nature and culture and with the meaning of their spatial relations. If we say that our job is only to synthesize, we are likely to become dependent in all things on others for the validity of what we assemble and interpret.

Capacity to see, understand and adequately describe a region in its totality is something that will elude most of us. Description of area in this full sense is something we cannot teach the student in courses on geography as such. So few of us can do it ourselves; this is an art that comes only out of mature scholarship in many fields besides geography—in history and language, and with something of the poet's feeling for the harmony of man and nature. Some outside the field of geography altogether seem to catch something more of it than most of us. Even the pot-boiling writers of the Buffalo Bill serials of my boyhood leave me with a more vivid and lasting picture of the American West (be it right or wrong) than I have ever got from regional geography as such. The fact of the matter seems to be that while we may hold description of a region in its totality before us as a professional goal, most of us know full well that it is not in us to reach it.

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[7] C. O. Sauer: 'The Education of a Geographer,' *Ann. Assoc. Amer. Geogrs*, Vol. 46, No. 3, September 1956, p. 292.

LIMITATIONS OF A REGIONAL APPROACH

So all that most of us can do in our essays in description of area is to bring together assorted things of nature and of culture and look at them in their spatial relations. Most of the essays on regional geography that I have read do no more than this. In the doing of it we have made for ourselves a stylised sort of jargon that may well be keeping us from the higher things. Another thing that hampers some of us is that when we make these forays into the various fields of nature and of culture, we stop to ask ourselves how far we should go. I would say flatly that this is a negation of scholarship; as soon as we look only as far as we think we need, to get something we think will be useful for our geography, we are lost.

Here I think of the eager young American who enquires in his professional journal where he can get a climatology suited to his needs as a geographer. From G. T. Trewartha[8] he gets the only answer that could come from a true scholar, which is, in brief, to study climatology, a study that will *demand* knowledge of meteorological processes. In my own special field of geomorphology, too, we see the same sort of thing. Some, not seeming to like W. M. Davis's genetic approach to the study of landforms, teach a geomorphology that excludes it, out of considerations of 'the adequacy for geography of a geomorphology that is too preoccupied with genesis to consider adequately the present character of the earth's surface'.[9] For purposes of their discription of area, statistical measurement of things like relief, slope and profile are thought to be more or less all they need. The better and fuller understanding of surface forms that would come out of study of their evolution is to them not 'necessary'. This may be well enough as far as it goes, but a study of geomorphology without embracing the whole field of it is scarcely worthy to be so entitled. To describe without seeking to explain is not enough.

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[8] G. T. Trewartha: 'A Reply to: "What One Geographer wants from Climatology" ', *Prof. Geogr.*, Vol. 9, No. 1, January 1957, p. 8.

[9] W. H. Wallace: 'New Zealand Landforms', *N.Z. Geographer*, Vol. 11, No. 1, April 1955, p. 17.

Here I would quote Peter Scott[10] who says neatly and precisely just what I would try to say myself:

> The study of landforms is, I think, of inestimable value in the training of a geographer. It provides a powerful stimulus to get into the field. It requires selective observation and critical judgment as to what has happened to the surface studied. It links form to process. Such a training is fundamental. Moreover, every geographer profits by knowing how normal and glacial or marine processes fashion the face of the earth he studies, no matter from what specialist vantage point he may view it. It is by no means fortuitous that many who have contributed much to human geography began their careers in geomorphology.

Or, coming nearer home to us in Canterbury, I would ask you this simple question. How can you expect to look on our local mountain scene with any real understanding until you get down to knowing something about ice, how it accumulates, how it moves and how it marks the land on which it lies? It is a simple fact that there are many things about the nature of our river valleys and the behaviour of the rivers in them we have not hitherto understood because we have not known enough about ice and its action. Recent studies in this field will surely prove to be of inestimable value, but geographers who can distinguish only that which is flat from that not so flat, that high from that not so high, or that steep from that not so steep are not worth much to us here.

For many years past I have been giving a beginning course in the elements of genetic geomorphology to students. If you tell me now I have gone the wrong way about giving them something of an eye for country I am unrepentant; and when you tell me that in my study of landscape I should stick to description because to consider genesis would take me out of geography into history, I can only say that this is absurd. However, on this matter I find Professor S. W. Wooldridge[11] more forthright than I am when he says:

> I have no desire to enter upon one of these methodological disputations of which we, as geographers, are perhaps inordinately fond, and I will content myself with affirming that, if the study of the shape and shaping of the physical landscape is ever expelled, through prejudice or ignorance, from the ambit of geography, our subject will have lost much of its historic birthright, including even the right to its time-honoured name.

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[10] P. Scott: 'The Geographer in Tasmania', *Univ. of Tasmania Gazette*, May 1958, p. 83.

[11] Wooldridge: *op. cit.*, p. 124.

However, I must bring myself back to my main theme which is that you should not let your field of enquiry be confined. When your curiosity leads you into the systematics do not be deterred from following your interest as far as your own ability will take you, even if some methodologists may tell you that, if what you are doing has not reference to area, it is not geography. There are many scholarly geographers in Europe and America who will not think any the less of you for it.

Research at Home and Overseas

Beyond this urging of you not to let the scope of your geographical enquiry be too much confined I would not try to tell you what you ought to pursue. Have your disputations on methodology by all means; these are always stimulating and useful, if only as exercises in semantics. Twenty-five years ago those in this country who might be called geographers were few; now we are many. Interest in things geographical is widely spread among our people, as indicated by the remarkable growth and success of our society. It is the privilege and function of the academic people in the universities to give a lead and stimulus to all this proliferating interest. But ours is a little country detached from the world at large, and concentration on it alone would not be healthy. So I would urge that some of you at least might well till some field of special interest in some other country.

Here I note with special interest that currently young American geographers are actively encouraged through the National Research Council and the Office of Naval Research to do this very thing. If we do not bestir ourselves to this sort of work, others among us will take the opportunity from us. We have already close and continuous ties of interest with Britain and the United States; it is first-hand field studies in *other* parts of the world that I suggest to you. Some coming to us from such experience, as in Africa, show already how profitably our sights may be raised above the horizon of our own little local world. I have noted the happy and useful results of our system of visiting lecturers. Time may well bring you the opportunity to extend this beyond the older established centres of the West to the new university centres that are growing up in Southern and Eastern Asia. Many of the problems of your future will have their roots in this area, and anything you may be able to do in the way of promoting interchange of teachers and ideas with it would help us all to better and more friendly mutual understanding. Especially would it make opportunities for the sort of fieldwork that I would have our academic geographers do.

This address is already over long and I will end it. I have looked at the teaching of geography in the teachers' colleges and the schools; made a plea for betterment of the status of teachers' college lecturers in general; traversed the beginnings of geography in the University of New Zealand; and said something by way of a sermon on scholarship in geography to my university colleagues. In this latter I have quoted Professor Carl Sauer, and to conclude I will quote him again;[12]

> There is nothing wrong with academic geography that a strong coming generation cannot take care of. We can have the needed succession if we free it as much as we may to do what each can do best and wants most to do. It is not for us to prescribe by definition what they shall work at or by what method they shall do so. Academic freedom must always be won anew.

If in this address I may seem to have made too much of what I have been doing myself, I would but remind you that I have been speaking as a teacher to those of you who are teachers too. I have had some long experience in the business of teaching, beginning as a pupil-teacher in February, 1911, at the age of fifteen. You have it easier these days. So for something appropriate finally to say may I go to the Book of Ecclesiastes: 'Wherefore I perceive that there is nothing better, than that a man should rejoice in his own works; for that is his portion: for who shall bring him to see what shall be after him?'

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[12] Sauer: *op. cit.*, p. 299.

THE COALFIELDS OF THE LOWER HUNTER VALLEY

M. G. A. WILSON

BLACK-COAL production in Australia has always been dominated by the fields of the lower Hunter Valley; first by the Newcastle field located on the coast, and latterly by the combined output of the contiguous Newcastle, Cessnock and East Maitland fields. A century and a half of coal mining has contributed to the evolution of an area unlike any other section of the Hunter Valley.

Coal mining, one of the least obvious of the many activities pursued in the lower Hunter Valley, is at the same time one of the most important, not only to the valley, but also to Australia. To the valley it is important in that some 11,500 mine workers and their families are directly dependent on the industry. To Australia, and also to the valley, it is important as the source of much of the raw material used in electric-power generation, in gas production, and in the iron and steel industry, on which, in turn, so many other activities depend. In all, some ninety-five percent of the annual output of eight million tons is used for the production of gas and electricity, metallurgical coke, general industrial purposes, or in transportation, in all states of Australia and overseas.[1]

The demand for coal from the lower Hunter Valley in other states, however, has declined since the immediate postwar years. Black coal, because of irregular supply, has in many instances been replaced by local fuels, usually lower-grade coals, and petroleum products. This replacement of coal, and the consequent recession in the trade, has had widespread repercussions in New South Wales. Nowhere in the state are they more pronounced, however, than on the coalfields themselves. Retrenchment of labour, closing of mines, and the accumulation of large quantities of mined coal* have brought unemployment to the coalfield communities, especially to those of the Cessnock field where few other avenues for employment exist. The field-wide strikes, pro-

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[1] Joint Coal Board: *Ninth Annual Report, 1955–1956*, p. 85.

*The accumulation of coal 'at grass'—the stockpiling of coal by colliery owners rather than by consumers—has significant implications for miners since it places them at the mercy of the management in industrial disputes. For this reason, the Miners' Federation holds rather strict views on how much coal may be held at grass.—Editorial Note

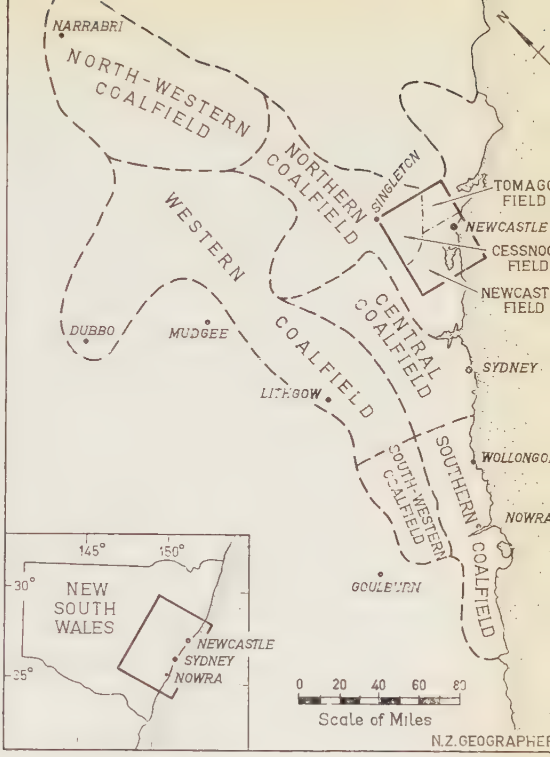

Fig. 1. Main coal province and coalfields of New South Wales, and location of the lower Hunter Valley coalfields area

tests and petitions, indicative of the feeling of insecurity, illustrate the traditional cultural unity inherited from the early Scottish and Welsh miners. This cultural unity and the special problems of the area contribute, along with the more concrete features of the coal-mining complex, to an areal personality distinctly different from the rest of the Hunter Valley, and yet intimately related to it.

The coal deposits of the lower Hunter Valley form only a part of the larger New South Wales coal province which extends saucerlike beneath Sydney southwards to the Bulli field, and westwards to the Lithgow field (*Fig.* 1). In all, the province occupies an area of approximately 16,550 square miles. The Upper and Lower Coal Measures comprising the basin are Permian, and both contain coal seams, but only in the northern coalfield, of which the lower Hunter Valley fields form a part, do the two measures outcrop in close proximity. In consequence there are three areas of coal production. The relative importance of these three fields is shown in Table I.

STRUCTURE OF THE COALFIELDS

The coal measures dip towards the south and are separated by considerable thicknesses of sandstones, shales, conglomerates, mudstones and limestones, often disturbed by volcanic intrusions and flows, usually basaltic.[2] The Lower Coal Measures, separated from the Upper Coal Measures by five to seven thousand feet of marine sediments, are made up of fine conglomerates, clays, sandstones, shales and coal seams, all characterised by intercalation, lenticularity and impersistence. Unlike the Upper Coal Measures, however, which occur in a thick mass of three thousand feet, the Lower Coal Measures are relatively thin, occurring in a band from one to three hundred feet in thickness.

TABLE I

LOWER HUNTER VALLEY COALFIELDS

District		Reserves*		Production	No. of	No. of
		Actual	Probable	1955**	Employees	Mines
Newcastle	–	500	1,200	3,984,700	4,488	30
Cessnock	–	1,000	700	3,469,500	6,066	23
E. Maitland (Tomago)	–	100	200	414,100	400	8

*Millions of tons **Tons.

Sources: *Power Survey Report No. 3*, 1955; *Ninth Annual Report, op. cit.; Quarterly Statistical Report*, June 1956.

Within the lower, or Greta, measures, which outcrop horseshoe-like on the flanks of the Lochinvar Dome (*Fig.* 2), two seams are recognised: the Main Greta, or Top, seam, and the Lower Greta, or Homeville, seam. It is upon these two seams[3] that the Cessnock field has developed, and from the great thicknesses[4] of coal present is obtained most of the best-quality gas coal in Australia. The Upper Coal Measures, which are mined in the Newcastle field, contain a larger number of seams which are thinner and of a different quality from the Greta seams. In all, some fifteen seams[5] are present, outcropping concentrically, the oldest to the north, the younger progressively southwards. Eleven of

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[2] For detailed studies of the geology of the lower Hunter Valley coalfields, consult T. E. David: *Geological Memoirs of the Hunter Valley*, 1919, and F. G. Hanlon: 'The Geology of the N.S.W. Coalfields' in *Coal in Australia*, Aust. Inst. Mining and Metallurgy, 1953.

[3] They are sometimes regarded as splits of the same seam.

[4] The Main Greta seam is up to 34 feet thick, and the Homeville seam up to 22 feet.

[5] The Borehole and the Young Wallsend seams do at times join to form one seam.

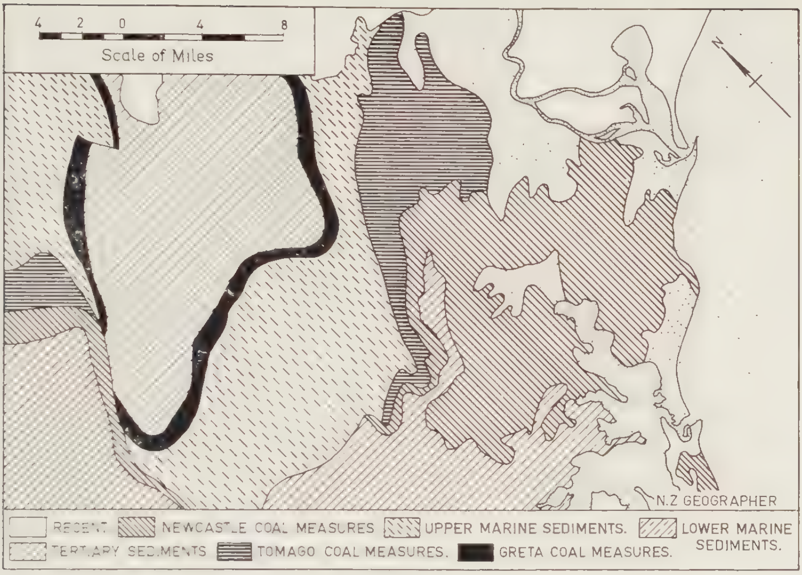

Fig. 2. Generalised surface geology of the lower Hunter Valley coalfields (*Source:* N.S.W. Dept. of Mines)

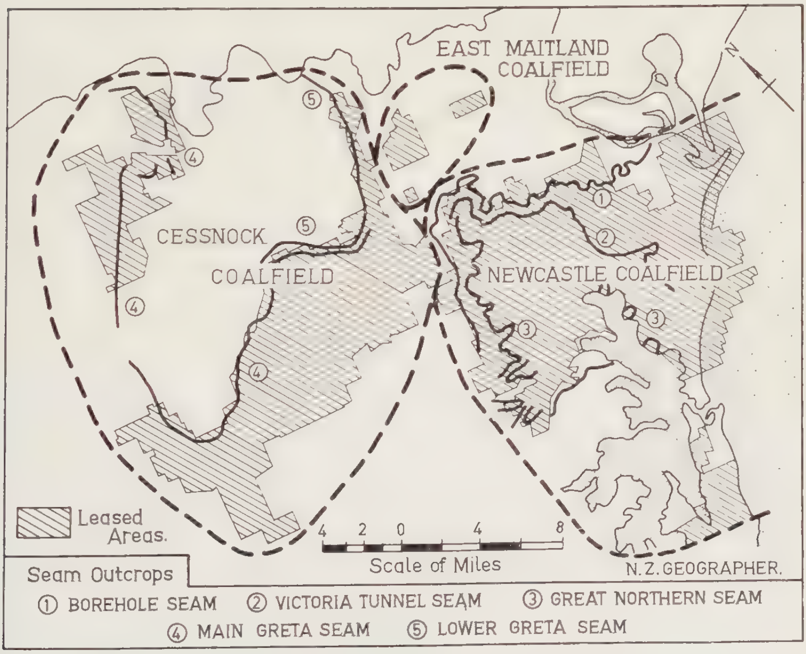

Fig. 3. Areas leased for mining, lower Hunter Valley coalfields, and major seam outcrops (*Source:* N.S.W. Dept. of Mines and L. J. Jones) these have been, or are being, worked. Quite large differences in thickness, both within individual seams and between seams, are found in the Upper Coal Measures, but the two most important seams, the Borehole and the Victoria Tunnel, are less variable in both thickness and occurrence.[6] (See Figure 3.)

The seven seams present in the East Maitland field are older than those of the Newcastle field. However, they are neither so numerous nor so thick as those above the Waratah sandstone which separates the Newcastle and Tomago stages of the Upper Coal Measures. Three of the seams have been worked, and they are similar to seams in the Newcastle stage in that they are either too dirty or too thin over large areas to warrant exploitation.

Although, because of the southwesterly dip of the strata, the seams of Upper and Lower Coal Measures outcrop within a short distance of one other, they vary greatly in properties, and hence the use to which they are put. Whilst the coals of the Greta seams are high in volatiles, massive or unbanded in structure, low in inherent ash and high in sulphur, those of the Newcastle seams are low in volatiles, strongly-coking, banded in structure, and high in ash content and low in sulphur. The Greta coals are sought after for gas production and for steam raising, especially in express locomotives, because of their ready ignition, whilst the Newcastle coals fulfil the requirements of a number of consumers. The upper seams, the Australasian, Fassifern, Great Northern and Wallarah, are steam coals used for general industrial purposes and for the generation of electricity. Coals from the older seams, the Victoria Tunnel, Young Wallsend and Borehole, are blended for coking purposes at the B.H.P. iron and steel works in Newcastle.

MINING AREAS AND LIMITATIONS

The three fields—Cessnock, Newcastle and East Maitland—make up the single largest bituminous coalfield area in Australia, but although the areal extent of the coal measures is large, only a relatively small section has been mined (*Fig.* 4). Today the underground workings of six groups of collieries make up the almost continuous strip two to three miles wide, which extends from Catherine Hill Bay to the Stockton Peninsula and westwards to the Mount Sugarloaf Range,

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[6] Whilst seams in the Newcastle field vary in thickness from one to forty feet, the Borehole seam varies from three and a half to nineteen feet and the Victoria Tunnel seam from six to fourteen and a half feet.

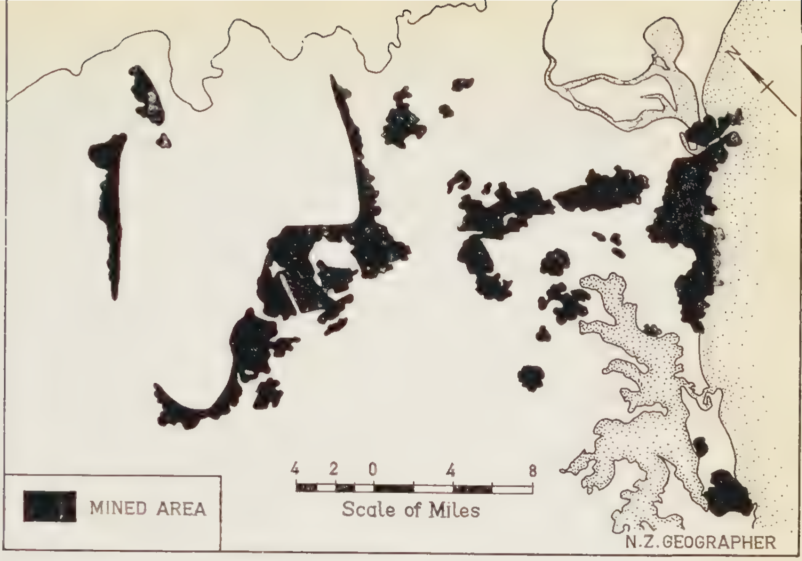
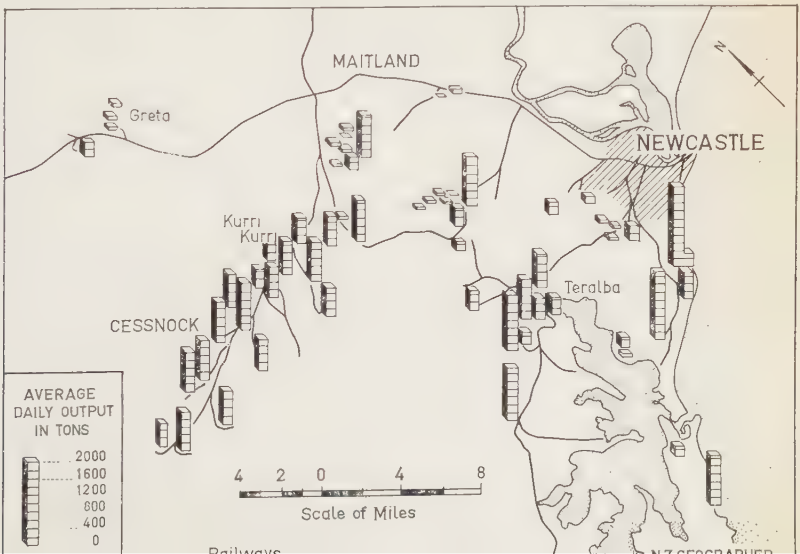


Fig. 4. Mined area, lower Hunter Valley coalfields

a northeast-protruding tongue of the sandstone-capped plateau to the south, which forms an effective physical barrier between the Newcastle and Cessnock coalfields (*Figs.* 2 and 3). A further contiguous group of mine workings extends southwards for approximately four miles from the outcrop of the Greta seam and makes up the mined area of the Cessnock field (*Fig.* 4).

The limitations imposed upon mining in the lower Hunter Valley that have led to this distribution of mine workings are both physical and economic: physical in that faulting, dyking and the thickness of the seams may limit extraction; economic in that differential coal

Fig. 5. Location and average daily output of mines in the lower Hunter Valley coalfields, 1956



quality and depth below the surface may limit mining.[7] In many cases, however, both physical and economic limitations, closely tied, apply.

The eastern limit to extraction in the Newcastle field is, however, neither physical nor economic, but legal, being the line of 120 feet of solid cover situated some chains out to sea. This limit, imposed by the Department of Mines as a safety precaution, has prevented the extraction of large tonnages of high-quality coking coals. On the other hand, mining of the Borehole seam has ceased two to three miles in from the outcrop as a result of both physical and economic limitations —the thinning of the seam to less than three feet six inches and a marked deterioration in quality.

The localisation of mining on the Cessnock field is rather the result of a combination of physical and economic factors: depth of seams, angle of dip and the expense of sinking deep shafts. All combine to restrict extraction to within five miles of the outcrop where up to 1400 feet or more of cover is to be found. On the eastern and western flanks of the anticline, a dip of up to sixty degrees, together with intensive faulting, restrict still further the mined areas.

All these, in addition to such local phenomena as faults, dykes and associated cindering, washouts and recent river erosion in the vicinity of the Hunter delta, have restricted the extraction of coal in the lower Hunter Valley coalfields.

MINING AND MECHANISATION

Since the first coal was picked from the outcrop at Newcastle in 1798, the location of mining, the methods employed and the ownership of mines have altered considerably. Coal mining has changed from a penal occupation to a privileged one; hand labour has been largely replaced by machines; and large, highly-capitalised companies, partially or wholly integrated with heavy industry and transportation groups, have assumed control of what was once a government monopoly. From the initial 'rat holes' along the outcrops in the area of present-day Newcastle, a centrifugal movement has taken place in the location of the industry; first, within the Newcastle field from the city area to the fringing suburbs, later, away from the Newcastle field to the Greta outcrop, and still later, on the Cessnock field, away from the outcrop.[8] Associated with this movement was a change from drift, or tunnel, mining to shaft mining as activities shifted from the outcrops, though recently this process has shown signs of reversal as a result of improved technology in the industry.[9]

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[7] Day-to-day requirements in the steel industry for different quality coals also affect the areas worked.

[8] In 1910, production from the Greta seam first exceeded fifty percent of the output in the lower Hunter Valley coalfields.

Although mechanisation of mining operations has been a feature of the coalfields of the lower Hunter Valley for many years, only a few mines can boast of the complete mechanisation of all operations from cutting to carrying. In these mines conveyor belts, shuttle cars, diesel locomotives and ten-ton-capacity mine cars replace the pit pony and the manhandling of one-ton-capacity skips. Continuous miners replace borers, shotfirers, picks and shovels, so increasing output per man-shift and conserving coal by rapid extraction. In this way the standing time of pillar coal is reduced, as is the likelihood of creep or spontaneous combustion.

In the majority of mines—those developed at earlier stages—partial mechanisation only is being effected. In many the main layout is unsuited to complete mechanisation,[10] whilst in others the haulage way cannot economically be modernised. In the latter case the capacity of the haulage system rather than the productivity of the face workers is the limiting factor to output.

Although the mechanisation of activities is common to all fields, and the bord and pillar system of extraction is, with one exception, general, certain differences do occur between mines of the Newcastle and Cessnock fields. These differences derive from the length of time over which mining has been carried on, physical conditions obtaining in the field, and the use to which the coal is put. Mine size, in terms of either output or employment, illustrates this.

SIZE OF MINES

On the Newcastle field, mines differ considerably in size, both the smallest (six tons per day and four employees) and the largest (2,300 tons per day and 794 employees) in the lower Hunter Valley being situated on it. The Cessnock field is characterised by a greater homogeneity of mine size, daily production generally being greater than 500 tons. Thus there is no mine typical or characteristic of the New-

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[9] Cross-measure 'drifts' are now replacing shafts in certain areas, along with the use of belt conveyors for the removal of coal from the pit.

[10] The usual bord and pillar layout has rectangular pillars, and the right-angle turn is not suited to easy manœuvring of modern mine machinery. Only in newly-opened places can this rectangular layout be altered to a rhomboidal system, thus reducing the acuteness of angle between bord and cut-through.

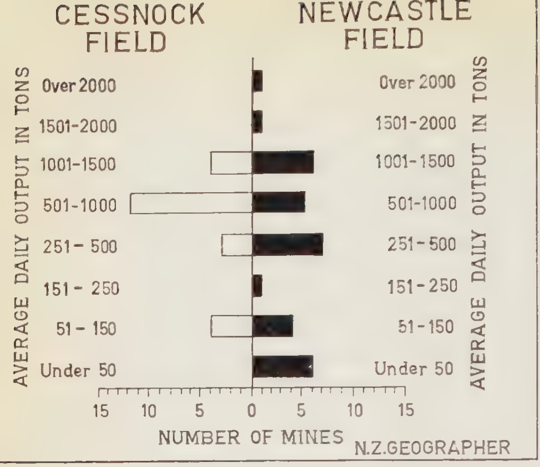

Fig. 6. Cessnock and Newcastle coalfields: comparison of size of mines

castle field, since daily production ranges without marked concentration between five and 2,500 tons. The dominance of a single producing group, 500–1,000 tons daily, indicates however that a mine of this size is rather more characteristic of the Cessnock field (*Figs.* 5 and 6).

The diversity of mine size characteristic of the Newcastle field reflects its greater age, and also the type of coal being produced. The small mine may represent the final stage in the working of inaccessible sections of the leases of now-defunct mines, or the transient 'rat hole' working of low-quality general-purpose coals at times when prices and markets favour the producer. The large collieries producing more than 1,500 tons daily reflect the demands of the iron and steel industry for large and regular supplies of coking coal. The homogeneity of mine size found on the Cessnock field is a product of the similarity in the size of leases and the period over which mining has taken place. On this field the leases were taken up and mining commenced in the first twenty-five years of the present century, and in all but the earliest opened, leases are still being developed and virgin coal driven.

LARGE COMPANY CONTROL

At various times during its 160 years of operation, the coal-mining industry of the lower Hunter Valley has been under the control of either the government or private monopoly. At the present time the industry is largely directed by a small group of large companies which have wide ramifications in Australian secondary and tertiary industry.[11] Since the coals of the Newcastle and Cessnock fields are complementary in quality and close in proximity, production in the two fields is dominated by the same colliery companies. Between them they account for approximately three-quarters of the total coal production of the lower Hunter Valley.

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[11] Vertical integration in the steel industry involves large mines on the Newcastle field, whilst Australian shipping firms are large shareholders in other colliery companies. See *Report of the Royal Commission appointed to inquire into and report upon the Coal Industry*, 1930, p. 259 *et seq.*

For the region as a whole, five colliery groups control more than one half the collieries working the three fields. These produce more than two-thirds of the daily tonnage and employ four-fifths of the mine workers. With certain significant deviations, this situation is duplicated on both the Newcastle and Cessnock fields. On the former, four of the groups operate and account for seventy percent of the daily production of the field, won from only one third of the mines. Because of the large size of these mines and of the many small mines that are found on the Newcastle field, the group-controlled mines employ over ninety percent of the mine workers on that field. On the Cessnock field, seventy percent of the production comes from the pits of the groups, but this tonnage is produced by three-quarters of the miners working in two-thirds of the mines. This illustrates the greater degree of similarity that is to be found in the size of mines on this field (*Fig.* 6).

Surface Features of the Coalfields

Ownership, degree of mechanisation and size vary from pit to pit, and from field to field. These variations find expression most obviously in the pit or adit head structures, insignificant though these may be when compared with the often vast underground workings they serve. Despite variations existing between the pitheads, they are the features which form an obvious distinctive characteristic of the coalfield region of the lower Hunter Valley. Spare, strictly functional, relieved only rarely by anything other than stark utility, these structures make up the cluster of brick, corrugated-iron, or asbestos-sheet buildings surrounding the shaft or tunnel mouth.[12] Stables, lamphouses, machine shops and bathhouses lie with apparent haphazardness about the winding house, tipple and screens. These last are elevated on steel girders or a forest of stout eucalypt piles, and from them the screened coal is fed by gravity into the hoppers and waggons crowding the maze of railway sidings which serve each mine (*Fig.* 7).

Common to all is the jumble of broken, discarded or disused equip-

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[12] Modernisation of mines has begun to spread to the surface. Attractively-designed modern office and amenity blocks are replacing at some mines the excrescences of wood and iron that have lasted for half a century.

Fig. 7. Pithead features of a shaft mine at Kearsley

ment: skips, cable, bogies, and the everpresent stocks of pit-props and mine timber brought from local state and private forests (*Fig.* 8), and from as far afield as the forests of the north coast.

These structures are set in sharply-defined clearings, cut from the thickly-growing, closely-encircling eucalypt bush (*Fig.* 9), above which protrude only boiler smokestacks, power-station cooling towers, plumes of smoke from shunting locomotives, and inverted bicycle-like poppet heads and sheaves (*Fig.* 7).

SETTLEMENT ON THE COALFIELDS

Most of the man-made features of the coalfields are associated in some way or other with coal mining, past or present, and one of the most important of these associations is that between mining and settlement. This is most evident in the more recently-developed Cessnock field but it is equally significant, if less immediately evident, in the Newcastle field, for Newcastle itself is the product of the peripheral expansion of a number of pithead shanty towns which have since coalesced and lost their original function, though not always their character.

The distribution of settlement on both fields is closely related to the geology. On the Cessnock field, a near-continuous ten-mile ribbon of settlement stretches along the outcrop of the Greta seams from East Greta to Bellbird (*Fig.* 10). The nine towns and villages comprising this strip contain between them ninety percent of the coalfield population.[13] On the more extensive Newcastle coalfield the settlements are more isolated and compact, are radially distributed as satellites fringing the Newcastle urban area, and are sited on or near the outcrops of

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[13] These settlements and their populations in 1954 were: East Greta (342 persons); Heddon Greta (313), Kurri Kurri (4,702), Pelaw Main (1,424), Weston (3,201), Abermain (2,014), Neath (452), Cessnock (14,417), Bellbird (1,501).

Fig. 8. Company-owned timber stand on a mine leasehold

seams in the Upper Coal Measures. In contrast to the settlements of the Cessnock field, they contain but a small portion of the total population of the field, and their internal forms are different. On the Cessnock field there is a tendency towards linear or ribbon development along transport and communication lines and seam outcrops; on the Newcastle field, however, the individual settlements are more compactly located around some nucleus, usually the mine, or former mine.

FUNCTIONAL DIFFERENCES

Inland location, comparative recency of development, and the proximity of Newcastle and an iron and steel industry based on coking coals from the Newcastle field have all contributed to the evolution of an almost 'monocultural' community on the Cessnock coalfield. The villages and towns house a population largely concerned with coal mining. In each of the outcrop settlements from Heddon Greta to Bellbird more than sixty percent of the male workers are employed directly in the industry, and many of the others are dependent on it (*Fig.* 11). Only in Greta and Branxton, on the northwestern section of the field, do other activities assume greater importance than

Fig. 9. Inhabited dwellings at Minmi hemmed in by the bush

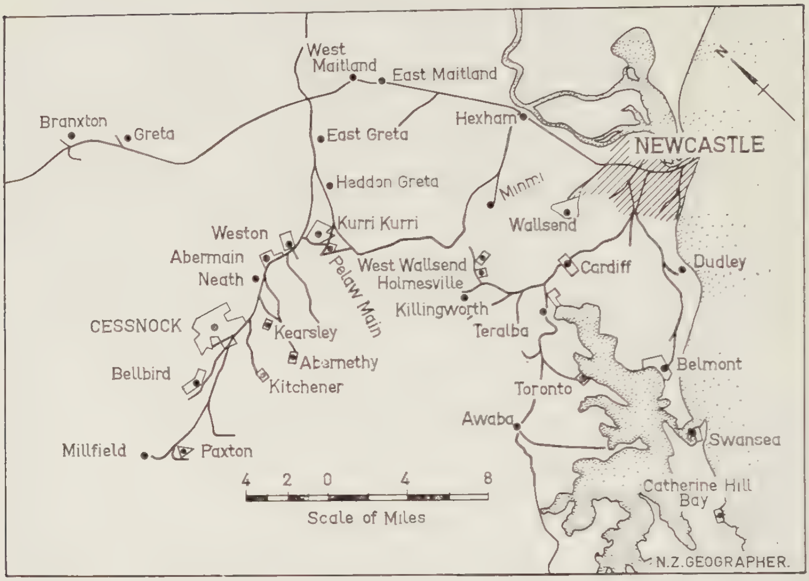

Fig. 10. The lower Hunter Valley coalfields: localities and main railway lines

mining.[14] The unbalanced structure of the workforce and the lack of alternative occupations in the close vicinity of the coalfield have served, both in the past and at present, to intensify the effects of depression or retrenchment in the coal-mining industry of the area.

Greater diversity of function is present within the townships of the Newcastle field, where the influence of the industrial-commercial complex of urban Newcastle is more strongly felt. The outward sprawl of the urban and suburban area has engulfed former mining villages, the establishment of light and heavy industries and associated commercial activities has transformed others. Although in many of the outlying settlements coal mining is still the single most important activity, occupying fifty percent or more of the male workers, the dormitory function is usually more significant. This, combined with local industry and commerce, directed in the lake and seaside villages to tourists, gives to the settlements an economic security not found on the Cessnock field, where the state of the coal-mining industry is quickly reflected in the activity of the commercial areas.

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[14] The percentage distribution of male workers in three major occupational groups in 1954 was as follows:

	Mining	Manufacturing	Commerce
Branxton	37.09	31.63	12.08
Greta	29.2	39.02	9.56

In the Newcastle urban area itself resides one quarter of the mine employees of the field. They comprise only eight percent of the male working population, however, and are overshadowed by the forty-four percent engaged in manufacturing. These mine workers are concentrated largely in fringing suburbs which have been incorporated in the city.

The satellite nature of settlements on the Newcastle field reduces the importance of coal mining as an occupation. The daily movement of workers to the industrial and commercial enterprises of Newcastle and its suburbs is more important than similar movements on the Cessnock field to Cessnock, Kurri Kurri or Maitland. Conversely, however, the daily movement of miners from the coalfield communities to mines all over the field is of greater significance on the Cessnock field.[15]

Homogeneity and Heterogeneity

Despite the similarity of origin which is reflected, to varying degrees, in the present character of the settlements of the two major coalfields, considerable differences are apparent in both form and function. Just

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[15] Formerly, miners lived in the settlement around or near the pit in which they worked. With the expansion of the industry, and with the improvement of transport facilities, this is no longer the case. Miners now travel long distances to work on each field, or even from one field to the other.

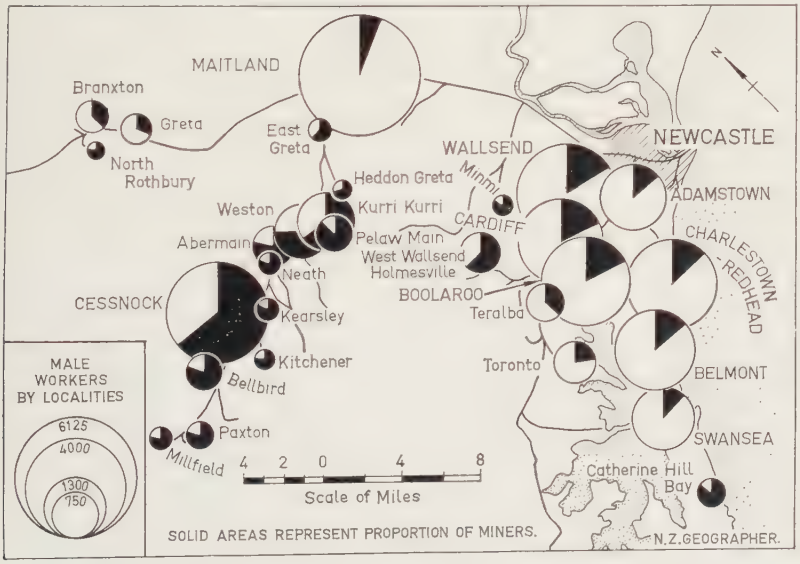

Fig. 11. Coalminers as a proportion of total male workers by settlements and areas—excluding the inner suburbs of Newcastle (1956) as mine size showed greater homogeneity on the Cessnock field, so too does settlement. Heterogeneity, on the other hand, is a characteristic of the Newcastle field. A sameness, deriving from house type, degree of maintenance, function and the drab scrub backdrop differentiates the Cessnock field from the Newcastle field, where settlement runs the gamut from ghost town to flourishing lake or seaside resort, and where the recent and rapid admixture of high-value housing contributes to the diversity.

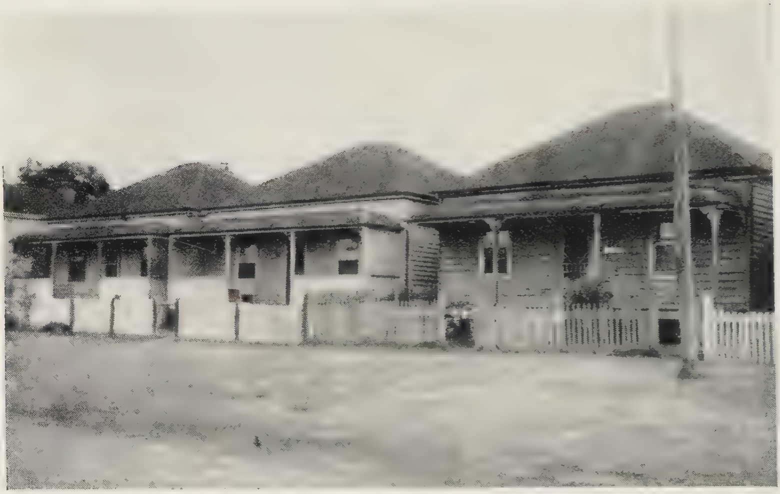

Fig. 12. Street scene at Kurri Kurri. Houses similar to or less valuable than these are characteristic of much of the Cessnock coalfield

The depressed, dilapidated appearance of much of the almost unbroken settlement from East Greta to Bellbird indicates that, even in times of prosperity, mining areas do not usually reflect the value of the natural wealth being extracted. Forty-five years of continuous occupation of homes built by the miners themselves on land to which they had no title have left their mark. Low-value residences lacking individual design, paint and amenities such as sewerage comprise the bulk of the towns and villages. Newly-built residences are rare, and the drab, begrimed paintwork, the rusted, unpainted corrugated-iron roofs, and the unkempt surroundings, intensified by repetitive building on adjacent, narrow-fronted lots, add to a monotony that is characteristic (*Fig.* 12).

In spite of this overall sameness in the residential areas of the Cessnock field, and despite the frequent occurrence of a row of five or six identical houses, there is some diversity which has resulted from the lack of any zonation by value of residences, with the exception of State Housing Commission blocks and parts of Cessnock. Cheek by jowl are lean-to shanties, abandoned homes awaiting demolition, the rare, more pretentious brick bungalow, and the row of timber residences, thirty-five years old, all exact replicas of one another. In the peripheral settlements of East Greta, Heddon Greta, Greta and Branxton new brick residences, emblems of increasing industrial development, stand out prominently amongst rows of miners' cottages which differ only in degree of decay.

Unlike some other coal-mining areas,[16] company ownership of residences, except for managerial staff, is not common on the Cessnock field, although in the first decade of this century this did occur. Miners today own their own homes[17] and this would appear to have been a contributing cause of the overall low standard of housing. The financing of better homes commits the miner to long-term repayments, and this in turn demands continuity of employment and stability in the industry. These have not been characteristic of the coal-mining industry in the past.[18]

THE 'PUB' AND THE 'CO-OP'

The field-wide similarity of settlement is derived not only from the residential sections but also from the commercial. With the exception of Cessnock and Kurri Kurri, which are more highly developed in this respect,[19] the coalfield township possesses but simple servicing facilities, dominated in physical and commercial stature by the 'pub' and the 'co-op'.[20] Apart from these, shops are small, usually supplying only the immediate day-to-day requirements of perishable foods and a few simple personal services such as hairdressing. Further similarity is shown in community amenities subsidised by the Joint Coal Board—swimming pools, libraries, sports clubs, and baby health centres—so that, although residences may be of a low standard, high-class recreation facilities are available to all.

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[16] See R. E. Murphy and M. Murphy: 'Anthracite Regions of Pennsylvania', *Econ. Geog.* Vol. 14, No. 4, 1938, pp. 338-348.

[17] Three-quarters of the occupied houses of the coalfield towns were in 1954 owned by their occupiers (*Census of the Commonwealth of Australia 1954*, Vol. 1, Pt. 3, p. 100).

[18] Loans by the Joint Coal Board, the repayment of which is made by deduction from the weekly pay envelope, and by Miners' Building Societies, also subsidised by the Joint Coal Board, have enabled some improvements in housing to take place.

[19] Using an index derived from the number of food to non-food shops in a settlement as an indication of commercial development and local significance, Cessnock and Kurri Kurri rate 2.0 and 1.5 respectively. The remaining settlements on the field are far more limited in range with indices of 0.25 to 0.8.

[20] The 'pub' and the co-operative store are the most imposing commercial edifices of each township. The latter is characteristic of coal towns in both the Cessnock and Newcastle fields and does not flourish in settlements lacking a coal-mining tradition. Maitland has only a small, unpatronised branch of the Kurri Kurri Co-operative Store. Weston, however, with only one seventh the population of Maitland, has its own large flourishing branch of the Cessnock Co-operative Society, and few other shops.

The unattractive, and often substandard, house is also common in the settlements of the Newcastle field, for these too were almost all coal towns originally, but the monotonous sameness is relieved by the greater intermingling of recently-constructed, individually-designed dwellings. These are occupied by commuters of a variety of occupations and salary groups, by local business and professional people, and often by retired city dwellers. Only in the more isolated settlements of Minmi, Catherine Hill Bay, West Wallsend and Awaba does coal mining dominate as an occupation, and there house values drop correspondingly.

In general, however, despite the higher average value of houses in settlements on the Newcastle field, a significant zoning occurs, the lower-value areas representing the early core built round a mine which no longer operates. Although the origin of the settlement may thus still be obvious, features characteristic of the Cessnock field—grime, drabness and sameness—are not so evident, or are compensated for by lake or seaside location (*Fig.* 13) or encircling eucalypt forest. Ghost town, dormitory suburb, lakeside resort and company village[21] are all present, adding their share to the diversity of settlement on the field.

GHOST TOWNS AND MINE RELICS

The ephemeral nature of extractive industries can be seen on both the Newcastle and Cessnock fields, despite the fact that large-scale mining has been carried on for only eighty years on the former and fifty on the latter. Abandoned shafts and tunnels, disused rail and tram tracks, waste dumps and ghost towns all indicate changes in the location of mining and its former significance in the area.

Ghost towns exist on both fields, but the recent rejuvenation that has characterised Heddon Greta on the Cessnock field is not found in Minmi on the Newcastle field. Physical decay and decline in population since the cessation of mining during the depression of the 1930's is here more extreme. Spread over hillside and valley, linked by grass tracks or cart ruts, are the hundred dwellings, or shells of former dwellings, of a once thriving company-owned community. The most prominent features are not the 327 inhabitants, but the tumbledown shacks, with their red-rusted corrugated iron, grey-weathered, rotted, gaping woodwork, and glassless window-frames. Sole remaining indications of former prosperity—which have received but little boost from the recent working of an opencut mine nearby—are overcommodious community buildings.

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[21] Catherine Hill Bay, an isolated coastal mining village of 160 houses constructed to two designs, is owned by the proprietors of a colliery situated there.

Fig. 13. Part of Catherine Hill Bay, the only company-owned mining town in the lower Hunter Valley

More widespread evidence of former mining activity is provided by abandoned mines and their transport facilities. Derelict head frames, overshadowing a tangle of timber, metal, brick and blackberry are to be found on the outskirts of townships such as Redhead, West Wallsend and Wallsend, whilst rubble heaps in bush clearings mark the site of now-demolished pit-top workings. Abandoned tunnels honeycomb the hillsides in the Glebe, Merewether, Cardiff and Wallsend districts. Embankments, cuttings and railway track, overgrown but still plain to see, cut swathes through bush and residential suburb alike, whilst discarded railway waggons, bogies and rails still litter some areas.

On the Cessnock field, in the Greta area, extensive piles of mine waste or slack coal, now grass and tree covered, have given the surface a pockmarked appearance. In some places these piles have been eroded to expose the coal. Similar features occur near East Greta and Heddon Greta, the first-mined section of the Greta seam outcrops. Railway tracks, abandoned, but raised above flood level on embankments of carbonaceous and shaley material, point the way to disused mines, whilst the tall boilerhouse smokestacks indicate from afar mine locations in the bush. Except in the eastern and western extremities of the field, however, where mining has been more difficult, the comparative recency of mining has restricted the occurrence of mine relics.

Undermining and Subsidence

Continuous extraction of coal for a century and a half has left little visible surface evidence of the extensive underground voids produced in the Newcastle field. The subsidence of roof strata, a natural phenomenon in areas where pillar extraction has taken place, has indeed in certain areas extended to the surface, but the damage has been slight, for in most cases 'fall-ins' have occurred in uninhabited, bush-covered areas.[22] An exception to this can be seen in the Cessnock field, where pillar extraction near the outcrop in the vicinity of Pelaw Main has resulted in the sudden subsidence of approximately fourteen acres, including a section of the township.

Although the greater part of the Newcastle urban area is undermined, vertical subsidence has not been common. Pillar extraction under the inner harbour in the early years of the century, however, did cause the bed of the 'Basin' to drop by four feet.[23] Creeps have at various times caused damage to structures at the surface, but this phenomenon has had but small effect upon building. Certain areas within the city limits are prone to subsidence, and limitations on future construction may be serious.

Power and Transport

With the exception of Catherine Hill Bay, the settlements of the lower Hunter Valley coalfields do not illustrate the control of colliery companies over their employees that can be found in other coalfields of the world. The dependence of the communities on the coal com-

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[22] Such subsidences, though at present harmless, preclude the use of much of the Lake Macquarie Shire for future building purposes.

[23] W. Humble: 'Notes on the Working of Submarine Coal in and about Newcastle', Paper read to the Newcastle Division of the Institute of Engineering, 1920, p. 5.

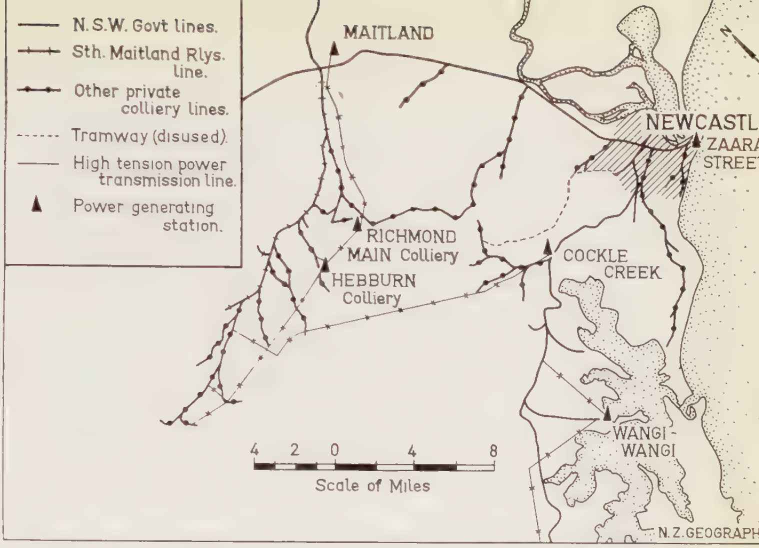

Fig. 14. Railways, power stations and transmission lines, lower Hunter Valley coalfields

panies is evident, however, when some of the public utilities of the coalfields, especially the Cessnock field, are examined.

The reticulation grid of the State Electricity Commission, which draws its power from both thermal and hydroelectric state-owned generating stations in various sections of New South Wales, includes the coalfields of the lower Hunter Valley. In normal times, however, the supply to the settlements of the Cessnock field and to a part of the Newcastle area is derived entirely from the colliery generating stations at Cockle Creek, Richmond Main and Hebburn No. 2 Colliery (*Fig.* 14). A network of high tension transmission wires, linking generating stations and colliery distribution stations, carves straight, narrow swathes across bush-covered hills and intensively-farmed river flats, and supplies the coalfield settlements with power at a cost lower than that of power generated by the state. The density of the network of power lines, their private ownership, and the crossing of one company's lines over another in order to distribute power in its own franchise area serve to emphasise the part played by the colliery companies in the area, and to differentiate it from the rest of the state, and the coalfields one from the other.

The network of railways which serves the coalfields forms an integral and highly-significant section of the state system. It differs, like the reticulation of electric power, from the remainder of the state system in that it is largely privately controlled. With the exception of the Great Northern Railway and a small number of branch lines on the Newcastle field, the entire system in the region is made up of colliery railways, or the private South Maitland Railway, which operates passenger and freight services for the Cessnock field in conjunction with the government railways. Some three and a half million tons of coal are conveyed annually on this line.

With the exception of the Great Northern Railway, the only line serving both the Cessnock and Newcastle fields is the colliery-owned Richmond Vale line, which provides a route not only for the company's own coal, but also, in times of flood, for the output of the rest of the Cessnock field. To this line, and more particularly to the South Maitland line which links East Greta Junction and the western mines and settlements, run the many private colliery lines that disappear into the scrub and bush south of the outcrops. These form the arteries along which the coal traffic flows as regularly as production will allow, initially to East Greta Junction and the Great Northern Railway, thence to Hexham where loading facilities for colliery-owned 'sixty milers' (colliers plying between Newcastle and Sydney) are maintained by two companies, or to the port of Newcastle. (See Figure 10.) The volume of coal traffic is to some extent indicated by the duplication of the double track between East Greta and Port Waratah, Newcastle, two sets of track being devoted entirely to coal traffic.

On the Newcastle field the system of railways is almost as dense as it is on the Cessnock field, although the lines are radial from the focus of the port in order to serve a more widespread area. The majority of lines, though colliery-owned, are now only interesting if annoying reminders of the former extent of mining, both within urban and suburban Newcastle and without. Some carry a few trains weekly, others are completely abandoned.

The resultant network of interconnecting state and privately-owned railways, on which both state and colliery locomotives, rolling stock and crews are used, has led to a system of concessions and charges only slightly less complicated than that arising from the payment of wayleave and royalty to individuals and estates across whose property coal trains pass, or under whose property coal is mined. These charges, and the normal costs involved in transporting the coal, are significant in determining the relative saleability of coals of similar quality from various parts of the coalfields. They are in turn passed on to the consumers within the state or commonwealth or overseas who account for the annual export total of 6.5 million tons of coal from the port of Newcastle.

Fig. 15. Coal 'at grass' around an adit mine near Millfield

PROBLEMS AND THE FUTURE

Following years of prosperity the coal industry of the lower Hunter Valley, and of New South Wales generally, has encountered steadily-deteriorating market conditions during the last few years. Decreasing sales, which give rise to overproduction, have brought in their train a number of problems—problems which would ultimately have arisen. It is unfortunate that they should have eventuated at a time when the industry was adjusting itself to the first radical change in operations for some years, namely, increasing mechanisation and consequent rationalisation, for they have served only to intensify the effects of the change. Important on a state scale, the problems are even more significant when considered in their regional setting, for the decline in demand for coal when increased efficiency is being achieved has led to the closure of mines, retrenchment of labour, stockpiling of large quantities of coal, and the development within coalfield communities of a feeling of insecurity as the spectre of large-scale unemployment once more arises.

On both coalfields, but particularly on the Newcastle field, collieries have closed temporarily or permanently, and the laying-off of some 400 miners as a result of stockpiling of coal at a rate of up to 6,000 tons a week on the Cessnock field (*Fig.* 15) occurred during the first six months of 1957. Despite this, however, at the peak of the trend only 150 men were registered as unemployed on the Cessnock field, and only five on the Newcastle field, out of total coal-mining populations of 6,066 and 4,483 respectively. Alternative employment in the industries of Newcastle and in other coalmines absorbed much of the displaced Newcastle labour, but on the 'monocultural' Cessnock field the problem of unemployment was apparently more serious. However the gravity of the situation eased considerably with the acquisition of new markets, and in June 1957 only forty-three miners were unemployed on the Cessnock field.[24]

The change in the state of markets, and the development of the problems affecting the industry and the communities, have evolved from a variety of causes. Chief amongst these are the characteristic instability of the industry, through which regular supplies to consumers were disrupted (Table II), the unreliability of transport, and the inability of the industry to produce a fuel of a constant given quality.[25]

TABLE II

PERCENTAGE OF POSSIBLE MAN-SHIFTS WORKED

Field		1950	1951	1952	1953	1954	1955	1956
Cessnock	–	82.0	82.68	84.34	84.37	84.58	82.5	85.2
Newcastle	–	84.0	84.9	86.9	84.5	86.03	87.2	86.2

Source: *Ninth Annual Report: op. cit.*, Appendix 7, p. 102.

These, together with an ever-increasing price, have combined to produce a large-scale consumer-reaction to coal and the conversion of many to the use of alternative fuels more reliable in supply, more constant in quality, and comparative in cost. This reduced the demand for coal at a time when, by the installation of modern and expensive coal-winning machinery, the industry had geared itself for an inflated estimate of demands.[26]

The solutions to these problems, and the future of the industry and its dependent areas, lie largely in the hands of the industry itself. Rationalisation will eliminate pits worked uneconomically,[27] fuller mechanisation, working of double shifts,[28] and improvement of labour-management relations (or the overcoming of traditional attitudes) should all increase output per man-shift. Although employment in the industry will no doubt decline as a result of these measures, the price of coal to the consumer should decrease. Moreover, already there are indications that improved technology can reduce coal costs, and this, in conjunction with the recent rise in the price of oil fuel, may regain for the lower Hunter Valley some of the markets recently lost.

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[24] At the same time, vacancies for approximately 200 mine workers existed on the South Coast coalfield.

[25] The introduction of coal-washing plants which reduce the ash content and produce a more even quality has, to a certain extent, compensated for use of mechanisation and for the use of poor-quality coals.

[26] The Joint Coal Board in 1948–1949, after canvassing coal consumers, estimated a demand in 1953 of 18 million tons of N.S.W. black coal. To this end the industry geared its operations. Actual consumption was nearer 15 million tons, however, whilst in 1955 reduction of output in opencut mines was necessary to keep underground miners employed. (See 'Coal Crisis', *Current Aff. Bull.*, Vol. 19, No. 4, 1956.)

[27] This is already occurring, despite the cost 'shadow' imposed by colliery groups whose coal is marketed at a cost based on operations in a number of pits, some of which are high-cost, some low-cost, producers. Within the groups there is an apparent fall in production in those pits with a small output per man-shift—that is, the high-cost producers.

The future of the lower Hunter Valley coal-mining industry depends as much upon the wise conservation of resources as upon the solution of present problems. Recent reassessment of reserves present in the area indicates that the shrinkage of high-grade coal reserves in the Cessnock and Newcastle fields is much greater than that attributable to extraction since 1929. In addition, further large areas of the 'fire belt' in the Cessnock field—the section between Bellbird and Hebburn No. 1 collieries where spontaneous combustion most commonly occurs—have been sealed off, and, with the passage of time, further areas of unworked pillar coal become less easily mined. Conservation of that which remains is thus essential, and on this depends not only the future of the mining population, but also that of industry throughout the commonwealth.

Barrier stowage to eliminate or reduce losses by spontaneous combustion, the working of double shifts, and the use of opencut coal wherever suitable, will all implement a policy of conservation in the coalfields of the lower Hunter Valley, and will help to re-establish the industry in the eyes of the consumer. Such a policy would also ensure a continuity of employment, though possibly on a reduced scale, far more effectively than the establishment of dubiously economic carbo-chemical plants or alternative secondary industry in an area where high transport costs and a long tradition of industrial unrest more than offset such factors as the untapped reservoir of female labour, a male working population accustomed to shift work, and the availability of fuel and power.

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[28] For most efficient use, machines must be worked more than six hours daily, five days a week Coal conservation also requires rapid extraction of pillars to reduce losses by spontaneous combustion or creep. At present, except in special cases, double-shift production is not permitted by the Miners' Federation.

COMMERCIAL ORCHARDING IN NEW ZEALAND

GORDON J. FIELDING

COMPARATIVELY SPEAKING, commercial orcharding is a minor agricultural activity in New Zealand. In all, 15,473 acres were actually planted in fruit trees in January 1955, representing less than 0.04 percent of the occupied area of the dominion. This acreage is distributed unevenly throughout the country in non-contiguous, sheltered pockets of flat, or near flat, land (*Fig.* 1).

No characteristic New Zealand orchard landscape can be said to occur, for variation from district to district and diversity within even one district is a feature in this country. However, the small, owner-operated New Zealand orchard, with its large production per acre and its high degree of mechanisation, presents a contrast to the much larger, mixed orchards of England and to the specialised fruit farms of the United States. New Zealand orchards are tidy and compact, and each is complete with its own packing shed and spray equipment and with its low, many-branched trees patterned into parallel rows fourteen to eighteen feet apart.

On a basis of areal extent, the Nelson orcharding district is the largest in New Zealand, followed by Hawkes Bay, Central Otago and Auckland (*Fig.* 2). But such a basis for comparison overemphasises the significance of Nelson with its larger holdings and lower yield per acre. Both Auckland, with its closely-interplanted orchards, and Hawkes Bay with its higher productivity per acre, have a larger number of orchard holdings than Nelson, and exemplify some of the many regional contrasts which are to be found.

Apples are the most important fruit grown and, together with pears and quinces, contribute seventy-four percent of the value of the dominion's orchards production (*Fig.* 4). Yet despite this predominance, orchards are seldom given over to one kind of fruit, for, until recently, insecure markets made diversification advisable. Apples, pears, peaches and plums often grow together on the same holdings, although district specialisation is becoming increasingly pronounced. Nelson, for instance, is the leading pip-fruit producer, Central Otago

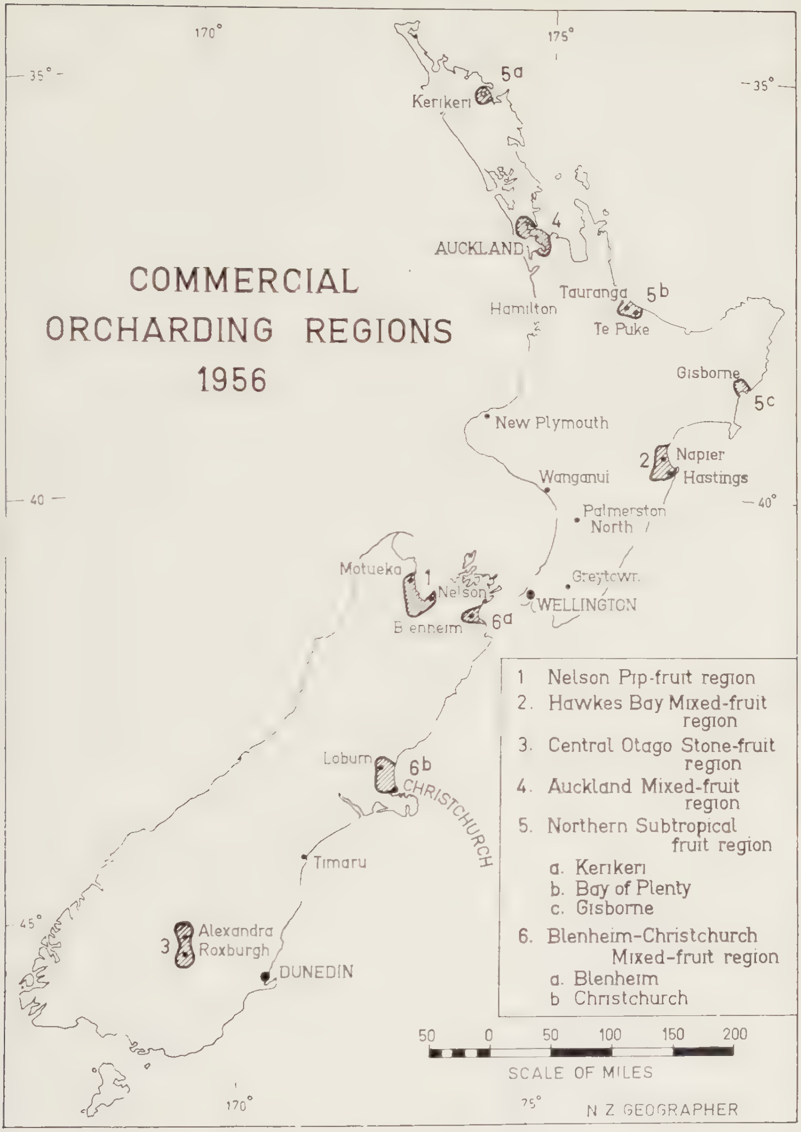

Fig. 1. Commercial-orcharding regions in New Zealand

specialises in stone fruit, and much citrus and subtropical fruit comes from the Bay of Plenty.

THE NELSON PIP-FRUIT REGION

Situated on the southern shores of a deep and sheltered coastal indentation, Nelson has for many years held pride of place as a fruit-growing district. Compared with other orcharding districts it has a larger area planted in orchards, and the produce of these orchards annually exceeds £1,000,000 in value. The fruit-growing area is essentially a narrow coastal strip, consisting of the plains of the Waimea and Motueka Rivers together with the section of the Moutere Hills which separates them. Both areas are characterised by the absence of high winds, by more than 2,400 hours of bright sunshine annually, and by freedom from late frosts.[1]

The orchards are irregularly distributed throughout this narrow coastal strip, and their pattern shows little relationship to varying physical conditions. Steeper slopes, however, have been neglected and, on the Moutere Hills, there is a marked preference for long, gently-sloping, northern aspects—a preference dating back to the original speculative plantings when a conscious attempt was made to copy methods already practised in Tasmania.

Speculative Development

Early settlers were quick to perceive the similarity of this region to successful orchard areas overseas, and therefore planted fruit trees. But real development did not begin until the success of apple exportation to Great Britain had been demonstrated in 1908. Following this, land-development companies purchased large blocks of the Moutere hill country and planted fruit trees with the intention of reselling the land. This speculative development continued until it was ended in 1916 by the war, and it is estimated that upwards of 7,000 acres had been planted through these schemes between 1911 and 1916.

In subsequent years much of this orchard land reverted to scrub, for the owners lacked both the capital and practical experience needed to bring the trees into production. Gradually the orchard area declined until now less than 3,900 acres are in fruit trees. The land companies exploited the potential advantage of this area, and although their activities were much criticised subsequently, there has emerged a flourishing orchard industry which may well not have developed had it not been for their initiative and persuasive selling policies. Of the orchards now remaining, more than two-thirds were planted between 1911 and 1916, most of these being part of land-development enterprises.

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[1] A 'late frost' in respect to orcharding is said to occur when the temperature in the screen falls below 31.9°F. after the blossoms have set.

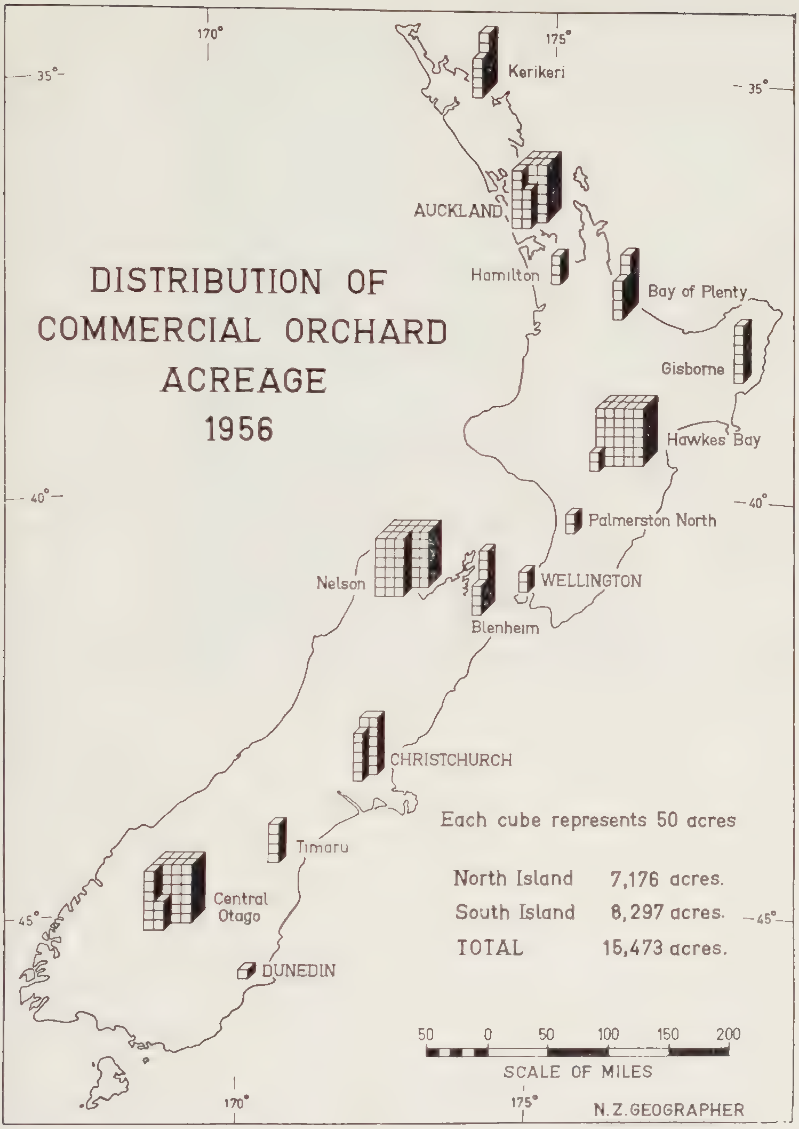

Fig. 2. Commercial-orchard acreage in 1956

Nelson's premier position is to be attributed to its extensive apple-growing industry. Nowhere else in the dominion are apples so important in the orchard economy and this region accounts for forty-six percent of the total apple production of New Zealand. By value, eighty-seven percent of the regional production is of this fruit, with pears contributing nine percent and peaches three percent. With some

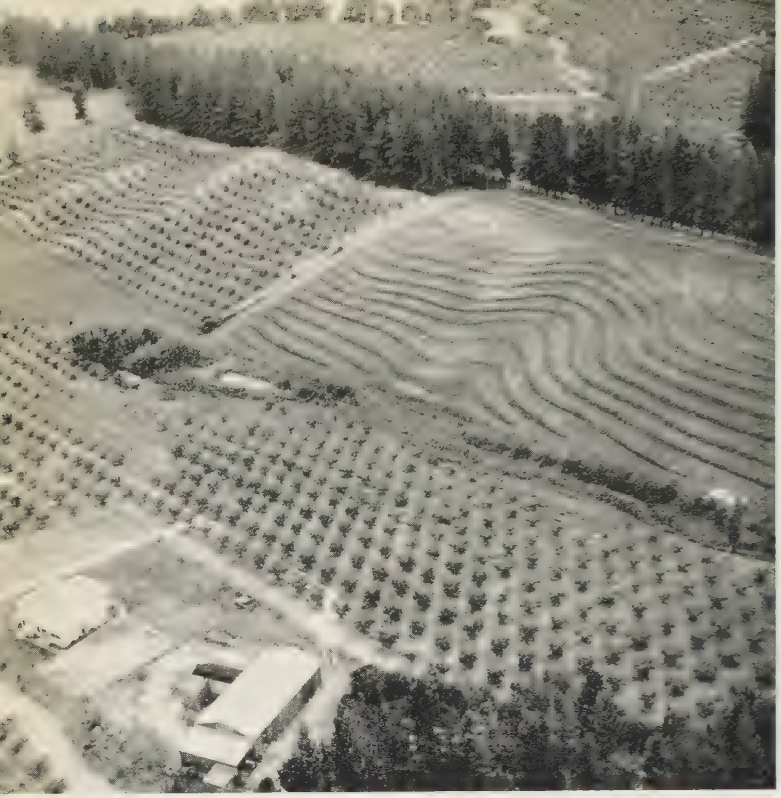

Photo: Soil Conservation and Rivers Control Council

Fig. 3. Orchard landscape near Nelson. The packing shed, apple trees, contour-cultivation and shelterbelts are obvious features

exceptions on the alluvial plains, apple trees are present in every orchard. Pear trees are not so nearly ubiquitous and occupy the damper hollows which apples will not tolerate because of excessive soil moisture during winter. Apples are favoured by better-drained, sloping land. Sturmer, Jonathan and Delicious are, in order, the major varieties of apples, whilst William Bon Chretien dominate among the pears. In comparison, stone fruit are of minor importance in this predominantly pip-fruit region.

The concentration on apples, the difficulty of obtaining seasonal labour, and the preference for the one-man, owner-operated orchard have all contributed to the high degree of mechanisation in Nelson—a mechanisation more advanced and more specialised than in any other fruit-growing region. In all, 350 tractors were operated on orchard holdings in 1956, and two-thirds of the apple trees were sprayed by one-man operated blast sprayers and the crop handled by some method of bulk harvesting.*

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*See 'Photogeography' in *N.Z. Geographer*, Vol. 5, No. 2, October 1949, pp. 152 *et seq.*—Editorial Note

Such a concentration of equipment indicates the high application of capital per acre on orchards in this district. This is a common characteristic throughout the dominion and, to a degree, holdings may be overcapitalised, for the machinery which is needed to operate the typical holding of ten to sixteen acres could adequately meet the requirements of treble the area.

Mechanisation has also induced specialisation; seldom, if ever, is the land between the trees devoted to the cultivation of cash crops. More often, a leguminous cover crop is planted in the late summer and turned under during the spring to leave the ground clean-cultivated during the harvest season from January to April. This practice, together with the liability of the Nelson region to heavy falls of rain of short duration, has accelerated soil erosion, and has created a major problem on the sloping land of the Moutere hill country (*Fig.* 3).

One of the most successful methods of checking the inroads of this unnecessary soil wastage has been the laying down of permanent pasture on the land between the trees. Already one fifth of the orchards has been grassed; nevertheless, soil depletion on the remainder continues in the absence of a more progressive policy on the part of the growers. There must be, in the near future, a considerable increase in the number of grassed orchards if production in this region is to be increased, or even maintained.

Problems of Disease and Labour

The elimination of disease and insect pests is another task which faces the Nelson orchardist. In comparison with the absolute humidity of other South Island districts, that of Nelson is high and aids the incubation of insect pests and fungous diseases. The critical months extend from October to February, and during this time orchards must be sprayed once every ten to fourteen days. Blast sprayers, which can be operated by one man, have reduced the unpleasantness of this operation, but their introduction has been compelled by the shortage of seasonal labour experienced in this region.

Apart from the 480 males employed permanently in orchards in the Nelson region, more than 900 seasonal workers are required. Unlike Hawkes Bay, where adjacent cities serve as a reservoir of seasonal labour, seventy percent of Nelson's seasonal labour force must be brought in from outside the region. Holiday workers are attracted by newspaper and radio advertisements, and at least two-thirds of the orchard properties provide accommodation for seasonal workers, a practice common only in Nelson and Central Otago.

From the orchards the fruit is transported by truck to the receiving depots of the government-organised Apple and Pear Marketing Board, and during the harvest season, fruit-laden trucks are a common sight on the dusty metalled roads, carrying the packed apples from the orchards to the tidewater depots. From these, the fruit is either placed in adjacent cool stores or shipped to Wellington for export.

Fortunate though Nelson is in having three conveniently-situated ports, transport difficulties have been a problem of constant concern. South Island markets are reached only by a costly road haul to the railway at Blenheim, while much of the export fruit must be transshipped twice before reaching the holds of oversea vessels. Damage resulting from this additional handling seriously impairs the quality of the fruit, and solution of transport problems is essential if orcharding is to progress. Isolated as it is from the South Island markets, and with only a small local market, the Nelson region is particularly oriented towards the export trade. In 1955 almost two-thirds of the Nelson apple crop were exported, this representing a greater proportion of the total production than in any other commercial orcharding region. Consequently, despite the fact that the six fruit-processing firms operating in this region employed 253 persons during 1956, there is no marked orientation of orcharding towards fruit processing. Only one orchard, sixty acres in area, is operated by a canning company.

Specialisation and Uniformity

In contrast to all other commercial orcharding regions in New Zealand, Nelson stands out as an area of pip-fruit specialisation. Almost as many apples are produced here as in all other districts combined, and the stocky apple tree standing in strong contrast to the light grey, almost yellowish, soil is the most conspicuous feature of the orchard landscape. Specialisation and uniformity, both directly derived from the speculative development of orcharding, are the most important regional characteristics, and linked with these is the difficulty in obtaining seasonal labour to harvest and deliver the concentrated crop as well as the trend towards increased mechanisation over the last three years. Soil erosion, insect pests, disease and transportation present many problems, but they can be solved by modern technology. It seems certain therefore, that the association of the Nelson district with apple growing will continue.

The Hawkes Bay Mixed-Fruit Region

Hawkes Bay is the most concentrated and most intensively-farmed commercial orcharding region in New Zealand and is second only to Nelson both in value of production and in acreage occupied. The orchards are situated near the southern shore of Hawkes Bay, with a pronounced concentration around Hastings. So situated, with the axial ranges of the North Island shielding the area from prevailing westerly air streams, this region enjoys a comparatively low absolute humidity and high insolation.

The 3,076 acres of orchard land in Hawkes Bay produce £889,770 worth of produce annually. Of this, sixty-three percent is contributed by apples, sixteen percent by peaches, and an equal percentage by pears. As apples are predominant this region bears similarities to Nelson, but the comparative significance of stone fruit justifies the designation 'mixed'. In general, every orchard is mixed, with approximately two-thirds of the area occupied by pip fruit and one third by stone fruit, and although, because of recent specialisation, apples have become the most important crop, this is still the district with the largest production of pears, peaches and nectarines.

Furthermore, speculative planting has played no part in the development of orcharding in this region. Orchards were planted by individuals who recognised the climatic advantages relevant to disease and pest control. Fruit preserving and jam making were begun as early as 1899, and the progressive nature of this industry has been largely responsible for the continued expansion of the orchard acreage. As most orchards were planted individually, holdings exhibit a greater diversity than is to be found in Nelson. Holdings are irregular in size, and the spacing of trees and the orientation of rows vary from orchard to orchard. Indeed, from the air the lack of pattern is obvious, and the landscape looks like a jigsaw thrown carelessly together.

High Production per Acre

In comparison with other orcharding regions, the outstanding feature of apple growing in Hawkes Bay is high production per acre. With alluvial soils of high inherent fertility and with artesian water available for irrigation, apple trees grow to twenty feet or more in height and produce, on the average, 650 cases to the acre. Indeed, winter pruning to check the phenomenal growth presents a major problem for the Hawkes Bay orchardist. Pear trees also yield heavy crops on the damper sections of the Heretaunga Plains, and physical advantage, together with the demands of the progressive canning industry, has established Hawkes Bay as the leading pear producer in the country.

Peaches are the stone fruit most widely grown and occupy sixty-eight percent of the stone-fruit acreage. The canneries are a major stimulus since they consume at least one quarter of the crop. Golden Queen, a late variety of yellow clingstone, is favoured for processing and alone accounts for forty-five percent of the peach trees planted. Plums, nectarines and apricots are also grown.

With apples, pears, peaches and apricots all contributing to orchard production, fruit growing in Hawkes Bay is a truly mixed economy. Pip-fruit and stone-fruit trees are grown on the same holdings, though usually in well-defined blocks without interplanting. Stone fruit were often planted as a temporary crop from which an early return could be obtained, but large blocks have been planted solely to meet the demands of the fruit-processing industry.

In terms of accessibility to local markets and availability of seasonal labour, Hawkes Bay has many advantages over Nelson, but it does suffer periodic damage from gales, hail and late spring frosts. Frost-fighting equipment is used, and tall shelterbelts surround the orchards which are virtually walled in by rows of tall poplars (*Populus pyramidalis*), stark and bare in winter and golden-hued in autumn. Together with the colourful peach blossoms they contribute to the kaleidoscopic changes for which the Hawkes Bay landscape is noted throughout New Zealand.

Markets and Disposal

Methods of disposal of the fruit crop from this region vary. The Apple and Pear Marketing Board is still the largest buyer, but more fruit is sold directly to the consumer than is the case elsewhere in the dominion, while more than one fifth of the pear crop and three-quarters of the peaches are used by the canneries. The two canneries which operate in this region use 212,000 bushels of fruit each season, 700 people being employed at the peak of the season. Indeed, much of the prosperity of this area and the progress of orcharding is linked with the fruit-processing industry.

Although orchards in Hawkes Bay are always liable to suffer damage

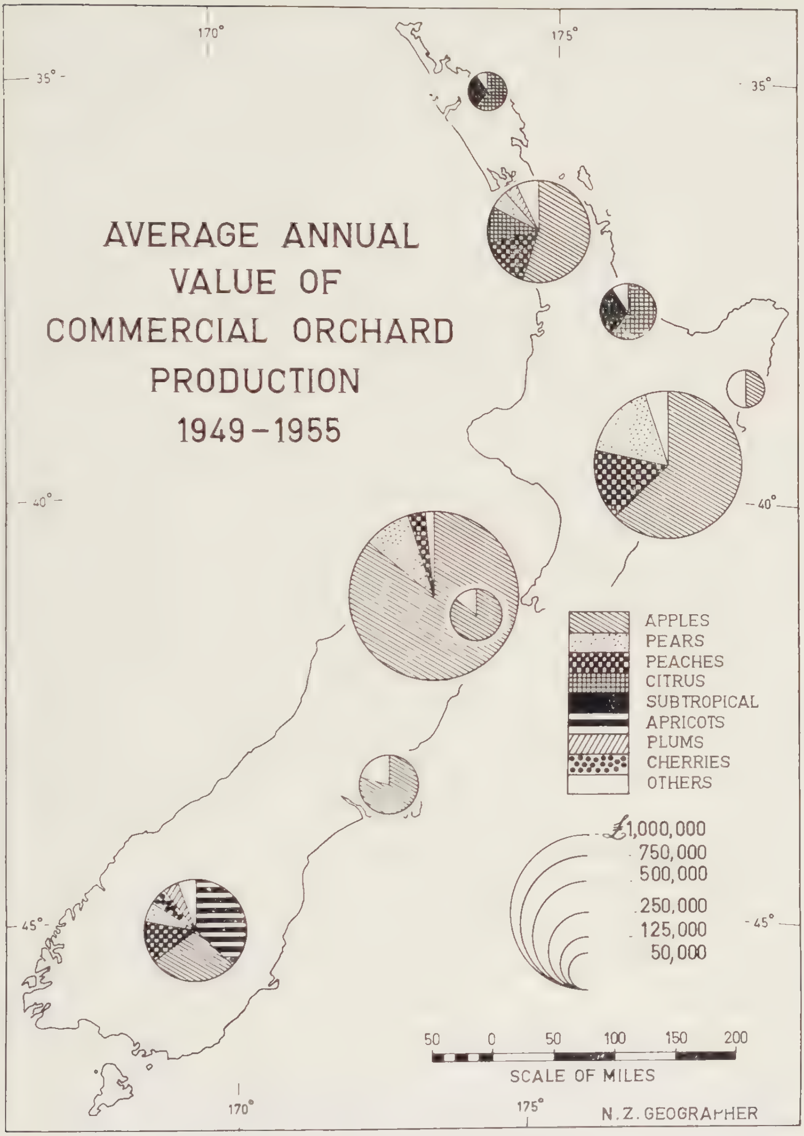

Fig. 4. Value of commercial-orchard production

from unusual climatic conditions, the comparative advantage for orcharding is greater than in any other part of New Zealand. Under stimulus from a continuously-growing North Island market and a progressive canning industry, commercial orcharding has developed steadily, and this without the speculative planting booms too often a feature in other New Zealand orcharding regions. Potentially the opportunities in the region for established kinds of fruit are limited only by markets, and if ever there ensues a time when New Zealand is required to extend its orchard acreage this region would be best suited, both physically and in terms of relative location, to support such development.

Central Otago Stone-Fruit Region

Lying just to the east of the axial ranges of the South Island, the Central Otago stone-fruit region is situated within a rainshadow trough associated with temperatures of 'continental' tendencies. Irrigation water is available, however, so that, favoured by low rainfall and by temperatures that are high in summer and low in winter, this region is well suited to the growing of high-quality stone fruit. More apricots, nectarines and cherries are produced here than in any other commercial orcharding district, and sixty-six percent of the regional output comes from stone fruit alone. In comparison, pip fruit is of minor importance. Commercial orcharding here has been made possible by irrigation, and the green hues of the orchard land and adjacent pasture present a dramatic contrast to the angular, rock-strewn hill country, almost devoid of vegetation (*Fig.* 5).

Broken into three wedge-shaped basins by the ranges through which the Clutha has cut gorges, the orcharding area occupies the sandy plains and impinging alluvial fans near the confluence of major tributaries with the Clutha. Alexandra in the centre, with 1,500 acres of orchard land, is the largest. To the north lies Cromwell and to the south is Roxburgh.

Variation is only to be expected in any orcharding region which extends over a distance of fifty miles, especially when situated in an area of contrasting microclimates as is the case here. However, stone-fruits dominate the tree association, and the unique physical conditions, together with the difficulty of marketing the crop, lend a unity to this region and make it easily distinguishable from other fruit-growing districts.

As in Nelson, speculative planting during the apple boom of 1910–1916 aided the expansion of orcharding, though not to the same extent as in the former district. Far more important to the development of Central Otago orcharding has been the availability of water from the disused sluicing claims. As gold production declined in the last three decades of the nineteenth century some of the miners began to cast about for a new source of employment. 'This, and the knowledge held by some of the progress made in similar areas in other parts of the world where irrigation water was available, caused the diversion for agricultural purposes of many of the water races originally constructed for gold mining.'[2]

Climate and irrigation were here the stimuli and their part in the early success cannot be denied. However, to a large extent, the proximity to the Dunedin market made development possible. Today the greater proportion of the population of New Zealand no longer lives in the South Island, and the comparative advantage accruing from location has waned. This has resulted in a growing specialisation, so that today new plantings comprise mainly blocks of apricots and cherries. These are fruits that bring high prices and are sometimes impossible to produce in more humid northern districts where disease is more prevalent.

Orchards are usually mixed in character, but this mixture is attributable less to a combination of pip and stone fruit than to a combination of different stone fruits. Apricots are the most popular, and this region produces ninety-two percent of the dominion output. Practically every orchard produces some apricots, but the greater part of the crop comes from a few large orchards with more than twenty acres devoted to this fruit.

Although apples are the second most important fruit grown, only in the northern subtropical fruit region do they contribute such a

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[2] W. S. Kemp: 'The History of Fruitgrowing in Central Otago', *N.Z. Journ. Agric.*, Vol. 90, No. 2, February 1955, pp. 169–187.

Fig. 5. 'Desert' and orchard near Alexandra

small part to the total value of production. The greater proportion of the apples comes from the pocketed areas of speculatively-planted orchard land at Riponvale and Ettrick. In neither place is water for irrigation readily available and the trees are small and gnarled, and possess a bark scorched black by the summer sun. The average production of 200 bushels of apples per acre is one of the lowest in New Zealand.

Peaches are far more significant in the orchard landscape, and the more common tree association comprises peaches and apricots rather than apples and apricots. Together with plums and cherries, these give a balance to the season's operations and permit of harvesting with the minimum force of permanent labour. Yet insignificant though cherries may be in the regional orchard production, Central Otago possesses one half of the dominion's cherry trees and produces two-thirds of the crop. Thus, in comparison with other orcharding regions, Central Otago has a unique tree association which finds its only counterpart in the sun-drenched valleys overlooking Christchurch. Nowhere else are stone fruit so important in the orchard economy, and yet it cannot be claimed that such an association is solely a response to particular physical conditions, for nowhere has man been compelled to do more to make an area suitable for commercial orcharding.

Irrigation is the life blood of the region. Rainfall is nowhere more than seventeen inches per annum—barely sufficient to support the sparsest of grassland—and the greatest part of this total falls in torrential summer thunderstorms and is of little use to fruit trees. Had it not been for the readily-converted sluice races it is doubtful whether the lavish supply of sunshine alone would have been sufficient to encourage development (*Fig.* 6).

As if to offset the disadvantage of meagre rainfall, the correspondingly low absolute humidity and wide seasonal range of temperature retard the spread of fungous diseases and insect pests. Brown rot and black spot, economically two of the most important diseases in New Zealand, are not nearly as prevalent as in more northerly districts, and as a result the spray programme is less intensive. Birds, however, are a much greater pest, and the caged cherry enclosures are the most obvious of the methods used to protect the ripening crop.

To prevent damage from late spring frosts, pails of oil are placed at regular intervals through the orchards. When the temperature falls below the critical point (which depends upon the stage of blossoming)

Fig. 6. Irrigation of orchards near Clyde

the oil is lit and the heat generated diminishes the danger. Liability to damage of this nature is twice as high in this inland orcharding region as it is in any other area, and one burn may cost the orchardist as much as £150.

Frost fighting is expensive, but nothing presents a problem for the Central Otago orchardist to equal that posed by the need to dispose of the stone-fruit crop. Handicapped by distance from the North Island markets, growers are faced with constantly rising transport costs and inefficient service. Rail is still the most popular means of transport, though carriage by air has become increasingly popular for fruit such as cherries and apricots where value by weight is sufficiently great to bear the additional freight cost.

In order to overcome this difficulty about one fifth of the fruit crop is sold by private-order trade, and the growers have sought to extend the fruit-processing industry. Three factories, one at Roxburgh and two in Dunedin, rely on fruit from this region, and they specialise in jam making as opposed to the orientation towards canning in the factories of Hawkes Bay. A further attempt to ensure success on the auction floor is the predespatch cooling of fruit in the orchards. Fruit thus refrigerated retains its texture for a longer period, and results have been so successful that more than a third of the growers have installed small cooling chambers on their properties.

These aspects of transport and marketing emphasise the precarious position of the Central Otago fruit-growing industry, faced as it is with increasing competition from districts now more favourably situated in respect to the major consuming areas. Yet this is an orcharding region with a distinctive physical environment, and it seems probable that this advantage will become more significant with the growing specialisation in the cultivation of apricots and cherries.

In this region stone fruits dominate the typical orchard, and successful production is in no small way dependent upon the shining stream of irrigation water, the greasy fire pot and the orchard cool store.

The Auckland Mixed-Fruit Region

Situated adjacent to, and partially within, the largest metropolitan area of New Zealand, this region naturally is oriented towards this local market. A great diversity of fruit is grown, and crops which would otherwise find difficulty in competing with the quality produce from the southern districts here find a ready sale through roadside stalls. With 419 holdings, Auckland has a greater number of commercial orchards than any other region, but these are small, closely-interplanted, and older than those of other districts. In terms of area it holds only third place. Here is ten percent of the dominion acreage and the region provides twelve percent of the national production by value.

The development of orcharding in Auckland began as early as 1838, but uncontrolled ravages of disease between 1870 and 1900 eliminated most of the trees, and it was not until the early nineteen-thirties that the settlers of Dalmatian origin revived orcharding by planting trees to the west of the city at Henderson and Oratia. During the second World War high prices were received for the local stone fruit, plantings were extended and many of the Dalmatian holdings (which until then had been partly subsistence ventures) became fully economic enterprises.

Stone fruits have remained popular, but with the improved marketing facilities for pip fruit a gradual change has taken place. Today fifty-two percent of the orchard acreage is occupied by pip fruit, and apples alone account for fifty-three percent of the total value of production. Peaches are the most popular stone fruit grown, but the difficulty of controlling disease, together with growing competition from Hawkes Bay, makes commercial production difficult. The citrus acreage is also declining.

With citrus, stone fruit and pip fruit all present in this area, and at times all in the one small orchard, no greater diversity of orchard landscape is to be discerned elsewhere in New Zealand. Interplanting in response to market demands is common, so that the use of mechanical aids is difficult in the crowded orchards. Consequently old and new techniques stand side by side. Where there is sufficient space between the trees automatic blast sprayers are used, but on two-thirds of the properties hand spraying is still practised.

Frequent spraying of the trees is essential, for this region is subject to attacks from all the bacterial and insect pests which trouble New Zealand orchardists. There is no prolonged period of winter cold to kill the hibernating insects, so that, after spraying at intervals of ten days during the growing season, a high incidence of disease is still not uncommon. Black spot, silver leaf, mildew and brown rot are but some of the more important diseases with which the Auckland orchardist must contend. Alongside these problems must be placed those of accelerated soil erosion and wind damage.

Significance of Roadside Trade

Such problems as these have been overcome, but only after increased financial outlay. As such, they do influence the character of orcharding and reduce the advantage of proximity to market. Perhaps the single most important method of disposing of the crop in this urban periphery is the roadside stall. In this region, orchards, hidden as they often are by shelterbelts, can easily be recognised by their roadside signs and makeshift stalls. At least one quarter of the apple crop and probably half the total fruit crop reaches the consumer through such private trading. Indeed, so great is the dependence of Auckland orcharding upon the roadside sale of fruit that it is doubtful if it could survive should such private trading ever be curtailed.

Overall, the character of commercial orcharding near Auckland is indeed mixed and finds its only counterpart in the orchards near Christchurch. Near Auckland every kind of fruit grown in New Zealand, with the exception of cherries and apricots, may be found on the small Dalmatian-owned holdings. To complicate the pattern further, grapes and vegetables may be grown commercially in the orchards. Holdings are small, untidily laid out, and dependent on roadside sales.

The *raison d'être* of orcharding here is the proximity to a large urban market and the preference shown by the New Zealand housewife for orchard-fresh fruit, although it is often of lower quality than that

All other photos:

Fig. 7. Lemons at Tauranga

purchased through the marketing organisations. Extension of housing in the rural-urban fringe is reducing the orchard acreage, but so long as difficulties of transport create higher prices and delays for fruit produced in regions physically better suited, produce from Auckland orchards is assured of a demand from the city market.

The Northern Subtropical Fruit Region

Although of only minor importance by total value of production, the northern subtropical fruit region is easily distinguished from other commercial orcharding regions, for it is on these sheltered, frost-free pockets of the eastern littoral of the North Island that seventy percent of the citrus and eighty percent of the subtropical fruit are grown. Apart from the Gisborne area, pip and stone fruit do not enter into the character of orcharding in this region, and the dark green foliage of the citrus groves, together with the tangle of closely interplanted subtropical fruit, forms a strong contrast to the regularly-spaced deciduous trees of other fruit-growing districts.

Kerikeri, situated at the head of an arm of the picturesque Bay of Islands, is the most northerly of the three districts included in this region. Here the growing of grapefruit, oranges and lemons is the primary activity and, although slightly modified by the planting of tree tomatoes and Chinese gooseberries during the last decade, the rapid expansion of sweet-orange plantings in the last five years has maintained this dominance.

The Bay of Plenty, the major fruit-growing district in this region,

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Fig. 8. Sweet oranges at Kerikeri

offers many contrasts to Kerikeri, for, with a higher rainfall, it is better suited to subtropical fruit production—in particular to Chinese gooseberries, passion fruit, tree tomatoes and feijoas. Citrus crops, especially lemons, still contribute half the total value of orchard production, but their comparative significance is declining as a result of the rapid expansion of subtropical fruit. In comparison, the scattered orchards of the Poverty Bay area hardly warrant inclusion within this region, as more than sixty percent of value of the orchard production is contributed by apples. Justification, however, lies in the many groves of citrus trees as yet not in full production.

This dominance of citrus and subtropical fruits is the distinguishing feature of this northern region. These fruits are liable to damage by even the slightest frost and are limited in their distribution to the humid eastern coastal districts of Northland and South Auckland. Even so, none of the three fruit-growing districts within this region can be described as completely frost-free, and the more successful orchards usually occupy the most favourable situations.

Until recently district specialisation has been negligible, but it is now becoming increasingly apparent. The Bay of Plenty dominates in lemon production whilst Kerikeri specialises in sweet oranges. In the case of subtropical fruits, the Bay of Plenty is by far the most important district, particularly in Chinese-gooseberry production, for it is equalled by Kerikeri in tree-tomato yield.

As it lacks the familar pip-fruit trees, this northern region is easily distinguished from other fruit-growing regions. Physically the three districts included are well suited to the production of citrus and subtropical fruit, although problems in transporting the fruit from these isolated areas are proving a major obstacle to expansion. It is the youngest of the fruit-growing areas, and to a certain degree this immaturity is reflected in the existence of many properties operated part-time with a low degree of mechanisation. Furthermore, this tree association is not permanent and fluctuates in response to profit margins. However, given the opportunity, this region may well produce citrus and subtropical fruits equal in quality to those produced anywhere else in the world.

The Blenheim–Christchurch Region

Orcharding is of minor significance near these two centres: together the total value of their production amounts to only one fifth of that of Nelson. Orchards are scattered except for the two speculatively-planted areas, one at Raupara just out of Blenheim, and the other, Loburn, north of Christchurch. Seventy-five percent of the fruit produced is pip fruit, with apples predominating. Stone fruits bulk large only in the sunny valleys of the Port Hills overlooking Christchurch.

Conclusion

The commercial orcharding areas in New Zealand may be differentiated in terms of the six regions noted here, and in each there is a certain degree of homogeneity in the type of fruit grown, in the methods of production, and in the disposal of the crop. Variety is indeed characteristic and regional contrasts are easily identified. Nelson with its uniform pip-fruit holdings is very different from Hawkes Bay with its mixed holdings. Similarly the irrigated orchards of Central Otago may be contrasted with the closely interplanted and untidy orchards of Auckland. All are adaptations to the demands of the markets they serve, and by the evaluation of these differences the developing orchard industry of New Zealand may be better understood.

PERIGLACIAL AND ALLIED PHENOMENA IN WESTERN OTAGO

J. D. McCRAW

MANY EXPLORERS and research workers have drawn attention to the distinctive patterns found in soils and surface deposits in some subpolar, alpine and subalpine regions. Stone nets, stone polygons, stone stripes and earth hummocks are among the many structures described. Washburn[1] has suggested the term 'Patterned Ground' to cover the wide variety of phenomena described by previous workers. The literature dealing with the subject is extensive, and many hypotheses have been advanced to explain the mechanism of formation of the structures. According to Washburn 'the genesis of patterned ground is far from established,' but he agrees with most other workers that intensive frost action plays an important part. Solifluction is of major significance where the ground is sloping.

Examples of patterned ground, however, do occur under climates where the intensive frost action that is apparently necessary for their formation is not experienced. These are regarded as relict structures formed under a more rigorous climate, possibly a 'periglacial' environment—the environment of an area adjacent to an ice sheet, especially the Pleistocene ice sheets.[2] Examples of these 'fossil' phenomena are recognised in many subapline regions throughout the world. The object of this article is to record and describe structures found in the mountains of western Otago, some of which are believed to be relict frost phenomena. Time did not permit detailed observations, hence no attempt is made to discuss hypotheses of origin, but structures observed on the Remarkables and on the Garvie Mountains during a reconnaissance soil survey of the Nevis Valley are attributed to frost action in a periglacial environment (*Fig.* 1).

The area is one of rugged relief, the Remarkables on the western side of the valley reaching an altitude of 7,680 feet, and the Garvie Mountains on the eastern side reaching 6,000 feet. Both ranges are

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[1] A. L. Washburn: 'Classification of Patterned Ground and Review of Suggested Origins', *Bull. Geol. Soc. Amer.*, Vol. 67, 1956, pp. 823–866.

[2] See W. Lozinski: 'Uber die mechanische Verwitterung der Sandsteine im gemässigten Klima', *Acad. Sci. Cracovie Bull.*, 1909, pp. 1–25.

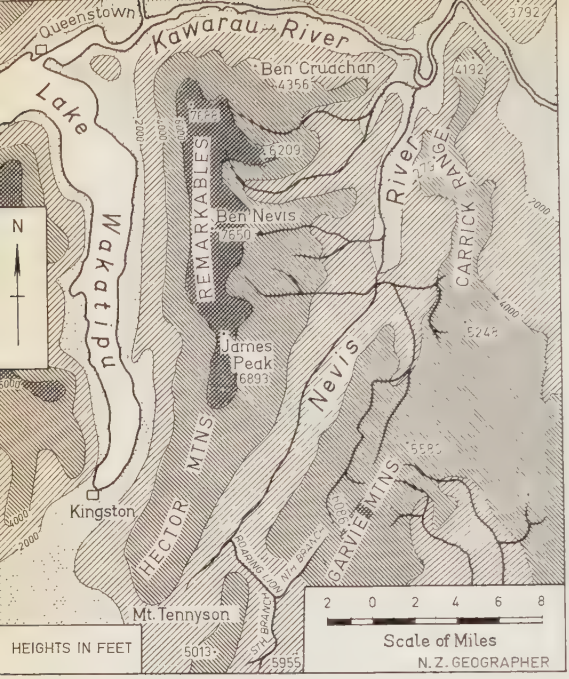

Fig. 1. The location of the Nevis Valley

of low-grade mica schist. The eastern slopes of the Remarkables ar steep and show evidence of former glaciation. The western slopes o the Garvie Mountains, on the other hand, are smooth broad flat-topped ridges that show no evidence of glaciation. The eastern slope of the Nevis Valley is moderately steep to an altitude of 4,000 feet; it then levels off to form a broad, terrace-like plateau several miles wide, and from the eastern margin of this the highest ridge of the Garvie Mountains rises steeply.

The floor of the northern part of the Nevis Valley has a rainfall of thirty inches per annum, but climatic data for the southern part of the valley and for the highlands are lacking. Extensive peat bogs on the plateau of the Garvie Mountains indicate rainfalls probably in excess of forty inches per annum. Snow lies for long periods on the uplands, and severe frost may be expected in the spring and autumn. Small patches of snow lie throughout the year on the eastern slopes of the Remarkables.

Four distinct groups of phenomena were observed: large earth stripes, earth hummocks, earth terraces, and stone 'drains'.

LARGE EARTH STRIPES

On the high plateau skirting the Garvie Mountains on the eastern side of the Nevis Valley most slopes between five and fifteen degrees are marked with well-developed corrugations running down the slope (*Fig.* 2). They are twelve inches high, about four feet from crest to crest, and range in length from twenty to sixty yards. They are mainly parallel, but not all are straight—some have sharp bends and others branch, but in some instances the separate parts rejoin. In the channels between the ridges, small angular stones have gathered to a depth of several inches, and vegetation is sparse, but the ridges are well clothed with blue tussock (*Poa colensoi*), *Celmisia lyallii* and prostrate species of *Dracophyllum*. A trench dug across a ridge showed a well-developed soil profile similar to that described as Kaikoura loam by Gibbs and Raeside.[3]

In some places the lower ends of the corrugations are buried under peat, and it is possible to trace the shape of the buried ridges for several feet out into the bog. On the upper parts of the slopes where the gradient is less, the ridges are broken transversely, first at wide intervals, then, as the slope flattens, at progressively shorter intervals until on a slope of one or two degrees the remnants of the ridges are indistinguishable from earth hummocks. (See below.)

Large earth stripes are especially common on the broad, rolling summit of Mount Tennyson at an altitude of 4,500 feet but are not seen north of the gorge of Roaring Lion Creek. The stripes, which are best developed on southern slopes but also form on northern slopes, are visible from a distance of several miles.

Small soil striations and stone stripes are widespread on New Zealand mountains and have been described by Zotov[4] and by Gibbs and Raeside[5], but stripes as large as those on Mount Tennyson have not

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[3] H. S. Gibbs, J. D. Raeside *et al:* 'Soil Erosion in the High Country of the South Island', *Dept. Sci. & Ind. Res. Bull. No.* 92, 1945, p. 22.

[4] V. D. Zotov: 'Certain Types of Soil Erosion and Resultant Relief Features on the Higher Mountains of New Zealand', *N.Z. Journ. Sci. & Tech.*, Vol. 21, No. 5, 1940, pp. 256B–262B.

[5] Gibbs and Raeside: *op. cit.*, p. 39.

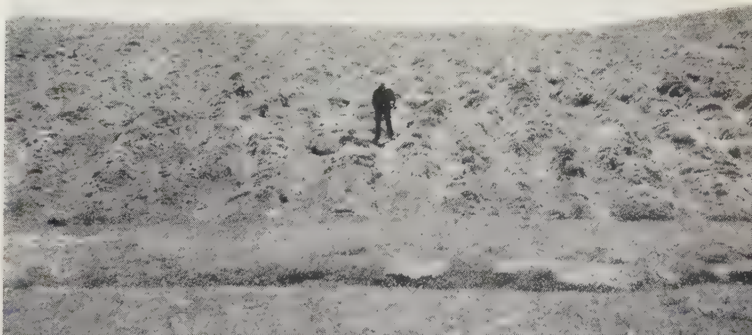

Fig. 2. Giant earth stripes on the summit of Mt Tennyson (4,000 feet). Peat bog in the foreground been recorded elsewhere in New Zealand. Stripes of similar size, but less perfectly developed, occur at an altitude of 4,500 feet in the headwaters of the Fraser River sixteen miles northeast of Mount Tennyson where the surface configuration is somewhat similar. Sharp[6] describes stripes of similar size on Mount St Elias in Alaska.

EARTH HUMMOCKS

Earth hummocks are confined mainly to the poorly-drained terraces and flat valley floors of the south branch of the Roaring Lion Creek, but some occur on broad, flat-topped spurs near the summit of Mount Tennyson. Well-developed hummocks four feet in diameter and twelve inches high, with a few up to eighteen inches high, occur on a terrace twenty feet above river level half a mile upstream from the junction of the north and south branches of Roaring Lion Creek (*Fig.* 3). Each hummock is separated from its neighbour by a roughly-circular depression less than a foot wide and floored by loosely-packed small angular stones. The hummocks are covered with a close mat o vegetation which consists mainly of blue tussock, but which include some small shrubs, and these accentuate the height of the hummocks The depressions support only sparse vegetation. A well-developed soil profile similar to that of Kaikoura loam was revealed when a hummock was opened up.

Hummocks occur on slopes of less than five degrees, but are most perfectly developed on flat surfaces. With increasing slope, hummocks become elongated and unite to form the large earth stripes described above.

ORIGIN OF STRIPES AND HUMMOCKS

Comment on the origin of these structures is here confined to a few observations that may have some bearing on their mode of formation. First, soils on the summit of Mount Tennyson are frozen to a depth of a few inches during spring and autumn, whilst the thick winter snow cover insulates the surface. Such a shallow depth of freezing is insufficient to explain these large structures. Second, the rolling and flat-topped summit ridges are mantled with deep sandy loam—the result of prolonged chemical and physical weathering. The upper horizons of the soil profile contain few stones, and this may account for the large proportion of fine material in the structures. Third, hummocks and stripes grade into each other, hence it is probable that

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[6] R. P. Sharp: 'Soil Structures in the St. Elias Range', *Journ. Geomorph.*, Vol. 5, No. 4, 1942, pp. 274-301.

Fig. 3. Earth hummocks on a terrace near the junction of the branches of Roaring Lion Creek

they are formed by a common process. Fourth, the structures appear to be stable at present.

The structures cannot be explained by any process known to occur under the present environmental conditions. The intact vegetation cover and the growth of peat over the corrugations suggest that these are now stable and are not forming under the present climate. It is suggested, then, that they were formed during a previous, colder cycle.

EARTH TERRACES

Well-developed earth terraces occur on the eastern slopes of the Remarkables and are particularly well formed on the spurs leading up to Ben Nevis at an altitude of 5,000 to 6,000 feet (*Fig.* 4). The largest terraces are thirty inches high and up to sixty yards long, the width varying with the slope, those on a ten-degree slope being up to ten feet wide and those on a twenty-degree slope only a foot or two wide. Few terrace scarps are straight, and the irregularity is most marked on steep slopes, as for example on slopes of more than thirty degrees on the eastern slopes of Ben Cruachan where the central part of the scarp is much farther down the slope than are the extremities and a distinctive V shape is formed. In some places where the apex of

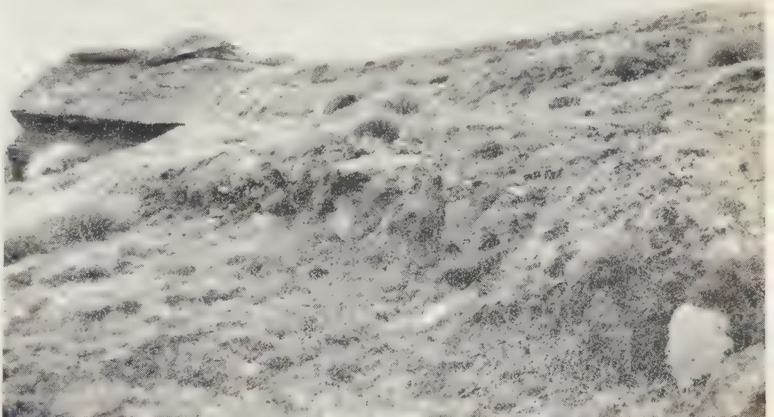
Fig. 4. Earth terraces on the eastern slope of Ben Nevis

the V has broken away, the side remnants lie at angles of more than forty-five degrees to the line of slope, and in this way form a characteristic herring-bone pattern when seen from a distance.

The terrace treads are not level but slope upwards at angles of up to five degrees to the foot of the next terrace. They are well clothed with vegetation, but near the foot of the scarp of the next highest terrace there are commonly bare patches where water lies after rain and the surface shows small soil polygons four to six inches in diameter. Where the tread is tilted across the slope much of the fine material has been removed by running water, and a strip of bare loose stones is left. The upper part of the terrace scarp commonly overhangs the lower part, or the scarp may be curved outwards from top to bottom. Clumps of blue tussock on the scarp tend to grow out radially from this curve, possibly signifying that the surface is under tension and that movement has been recent.

Origin of Earth Terraces

Zotov[7] attributes the formation of terraces to movement of animals and wind erosion. There is little evidence that these factors are responsible for the terraces on the Remarkables. Gibbs and Raeside[8] describe the terrace formation process as solifluction and it is certain that this is the process that formed the terraces on the Remarkables. The strong development of terraces below long-persisting patches of snow suggests that mass movement of the waste mantle while saturated with water is an important factor.

Soil movement can apparently take place under plant cover, as described and illustrated by Taber,[9] and there is no evidence on the Remarkables that the terraces are caused by accelerated erosion. Here they must be regarded as phenomena associated with normal erosion and not as a phase of accelerated erosion. In several places where accelerated erosion is active, terraces almost overwhelmed by scree from slopes above are to be seen.

Stone 'Drains'

On the steep southerly slopes of Ben Nevis another group of structures was noted and given the tentative name of stone 'drains'

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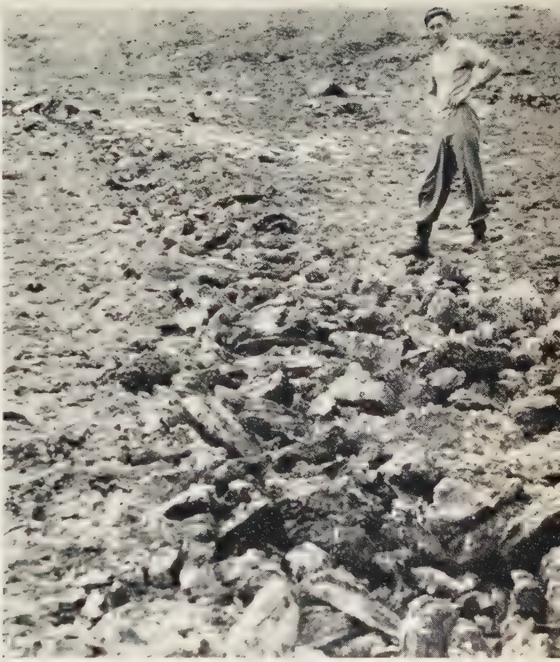
[7] Zotov: *op. cit.*, p. 262B.

[8] Gibbs and Raeside: *op. cit.*, p. 38.

[9] S. Taber: 'Perennial Frozen Ground in Alaska: Its Origin and History', *Bull. Geol. Soc. Amer.*, Vol. 54, 1943, pp. 1433-1548.

Fig. 5. Stone 'drain' on the southern slopes of a ridge leading up to Ben Nevis



(*Fig.* 5). A search of the literature available failed to identify these structures although they bear some resemblance to stone garlands described by Sharp[10].

They occur on moderately steep slopes of twenty degrees in coarse schist detritus flanking a small cirque. The drains are not confined to steep slopes, for they are seen on narrow, almost flat-topped, spurs, and structures which appear to be the first stage in the formation of drains are seen on the gently-sloping, debris-covered floor of the cirque. However, the drains are most perfectly developed on steep southerly slopes.

The drains consist of long trenches filled with angular stones. Some of the larger drains are more than two hundred yards long and more than ten yards wide, but most are narrower. The surface of the stones in most drains is level with the interdrain surfaces, but in some is slightly lower. Most of the stones are roughly oval in shape and from eight to eighteen inches long, although a few reach a length of several feet. Some show a definite orientation, which, from a distance, resembles flow lines. Those nearest the margins lie with their longer axis parallel to the slope and their shorter axis aligned across the slope.

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[10] Sharp: *op. cit.*, p. 277.

This orientation can be traced for four or five rows of stones in from the margin of the drains but is then lost in the heterogeneous mass of jumbled stones near the centre. It can also be traced into the pile of stones that lies below the 'outlet' of each drain.

Fine material is lacking except at the outlet, and the stones are loosely packed. In one place, near the centre of a drain, stones were removed to a depth of three feet without reaching a solid floor. The margins of the drains are well defined and sharply cut off from the interdrain surface. No vegetation grows on the drain surface apart from lichens on the stones. The interdrain surface is smooth and consists of several inches of coarse sandy loam over coarse schist fragments set in a matrix of coarse sand. Numerous large schist blocks protrude from the surface, which carries a sparse cover of mat plants (*Raoulia*, *Myosotis* and *Veronica* spp.) with scattered blue tussocks.

A number of drains were traced to their source high up on the slope where a narrow crevice widens in a short distance to the full width of the drain. In the first few feet a smooth floor slopes steeply down under the mass of loose boulders. The heads of some drains which lie below the crest of the spurs are of full width and depth, but on the crest of the spur immediately above these drains are large circular stone-filled pits resembling sink holes. This could be interpreted as indicating a subterranean connection between the pits and the heads of the drains just below the crest. In some places the lower ends of two neighbouring drains join. Large piles of debris mark the lower ends of the drains, and from these flow small streams and seepages.

Origin of Stone Drains

No satisfactory explanation of these structures can be offered at this stage. They may be remnants of very large stone nets or stone garlands which are attributed by oversea workers to frost action. Huxley and Odell[11] describe nets and garlands from Spitzbergen that are more than thirty feet in diameter. Richmond[12] describes large stone stripes from Wyoming that approach the Nevis structures in size. It seems certain, however, that the stone drains are not recent. If they are the result of frost action it is likely that they are relict structures formed during a period of more intense frost action.

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[11] J. S. Huxley and N. E. Odell: 'Notes of Surface Markings in Spitzbergen, *Geog. Journ.*, Vol. 63, 1924, pp. 207-229.

[12] G. M. Richmond: 'Stone Nets, Stone Stripes and Soil Stripes in the Wind River Mountains, Wyoming', *Journ. of Geol.*, Vol. 57, No. 2, 1947, pp. 143-153.

ON THE ORIGIN OF SOME LAKES IN CANTERBURY*

MAXWELL GAGE

THE COMPARATIVELY new term *limnology* denotes common ground where biologists meet other scientists whose studies are directly or indirectly concerned with lakes, including geomorphologists, who are sometimes expected to answer questions about the origins of lakes. Every lake offers a problem of interest to the geomorphologist because its very existence is in a sense a challenge to one of the important generalisations of his subject. During the past century and a half it has become axiomatic that the surface of the land owes its form mainly to the destructive and constructive modelling work of so-called 'geomorphic agents', of which running water and gravitational mass movements of soil and the products of erosion are regarded as the most important and most widely effective. Since the continued operation of these agents depends upon the maintenance of downward slopes, it is clear that any enclosed hollow must be regarded as an anomalous reversal of the normal hydraulic gradient of the land surface. The most familiar indication of such a reversal is a lake or a pond. It is not surprising, therefore, that at least in the geological scale of time, lakes tend to be unstable, temporary features of the landscape, destined sooner or later to disappear as a result of sedimentation combined with downcutting of the outlet.

GENETIC CLASSIFICATIONS OF LAKES

That the above-mentioned challenge has been taken seriously is indicated by the wide variety of explanations advanced to account for different lakes, and these have been collected into more or less comprehensive genetic classifications by some authors. Marshall[1] employed eight simple categories. At the other extreme, a recently-published treatise on limnology[2] defines no less than seventy-six types, some divided into varieties up to as many as five! Most practical purposes will be served by broader categories, such as those used by W. M. Davis in 1933:[3] *warped-valley lakes, fault-basin lakes, glacial lakes, landslide lakes, volcanic lakes, river-made lakes, artificial lakes* and *lake-like bays and lagoons*; to which list Cotton added *lakes due to local subsidence*, including seismic 'sag-ponds'.

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* This article is based on a paper read at the Second New Zealand Geography Conference held at Christchurch in August 1958.

[1] P. Marshall: *Geography of New Zealand*, Christchurch, 1905.

[2] G. E. Hutchinson: *A Treatise on Limnology*, Vol. I, New York, 1958.

In defence of the authors of more exhaustive classifications, it must be pointed out that their purpose is to assist in clearly differentiating between the many different kinds of processes and events that can give rise to undrained depressions, and it is not expected that every lake can be fitted into a single pigeonhole in any scheme. Most lakes owe their origin to more than one agency, operating simultaneously or at different times, as is well shown in some of the examples to follow.

Lakes within the Waimakariri Watershed

The author's attention was drawn to the varied origins of the lakes in the Waimakariri Valley as a result of a question from a biologist who was interested in the aquatic life of certain lakes. Of the nine lakes within the watershed that are large enough to show on the four-mile map series (N.Z.M.S. 10), six are essentially glacial in origin, two are impounded by alluvial fans and are equivalent to Davis's 'river-made' category, and one is dammed by a landslide. Although all nine are in a setting of glaciated scenery, only those essentially surrounded by surfaces due to glacial deposition, glacial erosion, or both, are classed as glacial. Nevertheless, it is within this class that one finds the greatest variety of ways in which undrained hollows may originate. Thornbury[4] lists seventeen varieties, several of which are represented in the Waimakariri Valley.

Lakes Marymere and Hawdon. Although situated close together, similar in size, and both glacial, Marymere and Hawdon differ in altitude by about 120 feet, and the basins they occupy originated differently (*Fig.* 2). Marymere, the higher of the two, is bounded by rock walls to the east and west, and by ablation moraine and glacial outwash gravels to the north and south. No large stream enters, and the lake exists because a depression extends below the water table. The only satisfactory explanation for the isolated depression is that it resulted from the delayed melting of a slab of stagnant glacier ice, buried and protected for a time by ablation moraine and fluvioglacial gravels, and formerly part of the 'Slovens Creek distributory lobe' of the Waimakariri glacier before it finally disappeared from the locality at the end of the last-but-one major ice advance (Blackwater-II advance[5]). Marymere is thus interpreted as a large kettle lake.

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[3] Quoted by C. A. Cotton: *Landscape*, Cambridge, 1941, p. 41.

[4] W. D. Thornbury: *Principles of Geomorphology*, New York, 1954, p. 403, (*after* Zumberge).

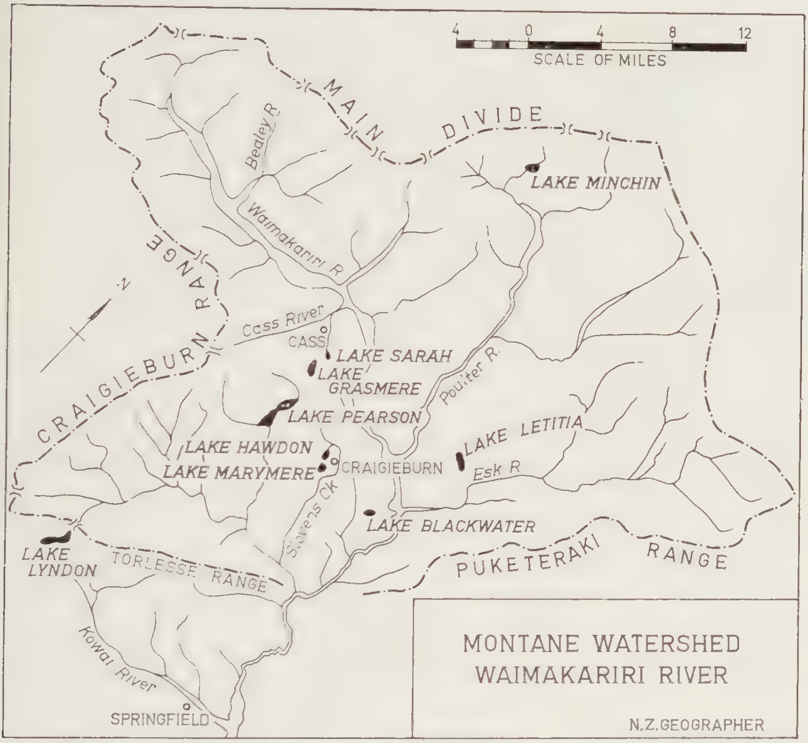

Fig. 1. Sketch map of montane watershed of Waimakariri River, showing locations of the lakes Minchin, Sarah, Grasmere, Pearson, Hawdon, Marymere, Letitia, Blackwater and Lyndon

Hawdon lies at a lower level in a glacier-excavated rock-hollow. Recent swampy alluvium at the northern end appears to have reduced the area of the lake, which formerly was bounded to the north by fluvioglacial gravels deposited by a meltwater torrent from the Waimakariri glacier. This glacier overflowed at Saint Bernard Saddle

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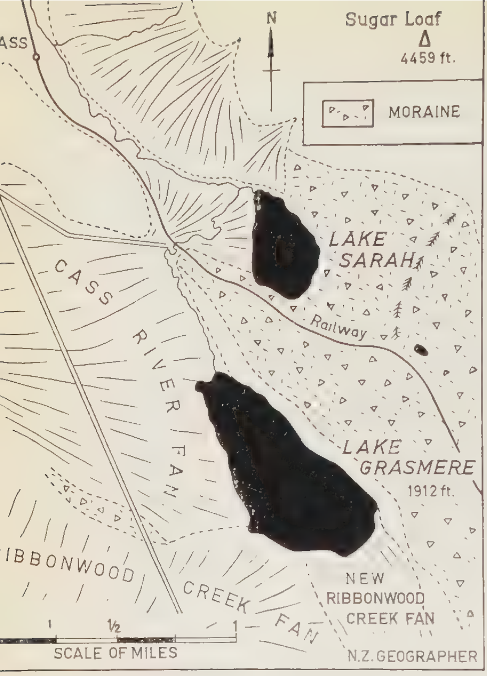
[5] M. Gage: 'Late Pleistocene Glaciations of the Waimakariri Valley, Canterbury, New Zealand', *N.Z. Journ. Geol. & Geophys.*, Vol. 1, 1958, p. 144.



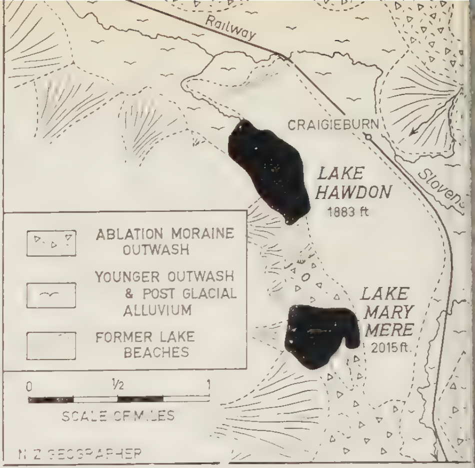


Fig. 2 (above). Lakes Hawdon and Marymere

Fig. 3 (left). Lakes Sarah and Grasmere

into the head of the Slovens Creek channel during the maximum of the last ice advance (Poulter advance[6]). Traces of old lake shorelines indicate the former existence of a lake or lakes at various slightly higher levels. It is uncertain whether there was a single lake considerably larger than Hawdon, or several proglacial or ice-margin lakes, for a time during the wasting of the glacier following the Blackwater-II advance. Speight[7] noted diatomaceous earth deposits near Craigieburn station, the existence of which supports the first alternative.

Lakes Letitia, Grasmere and Sarah. Letitia, a small lake, lies near Mount White station homestead, north of the Waimakariri River and between the rivers Poulter and Esk. It resembles Hawdon in occupying an ice-excavated furrow in bedrock, blocked by end moraine at the eastern end, while the western end is blocked by outwash gravels derived from the Poulter Valley glacier during a secondary peak of the Poulter advance.

Lake Grasmere lies at the base of a low ice-worn rock ridge capped by a stranded medial moraine of Blackwater age (*Fig.* 3). Until fairly recently the lake probably extended eastwards, perhaps as far as an end-moraine loop built by a small distributary of the Waimakariri glacier which invaded the Cass Basin during the Poulter advance. However, the modern alluvial fan of Ribbonwood Creek has continued to encroach upon the area of the lake into historic times. The remainder of the lake perimeter is formed by the older fans of Ribbonwood Creek and Cass River, of uncertain age, but possibly dating from as far back as a late stage in the Poulter advance.

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[6] *ibid.*, p. 148.

[7] R. Speight: 'Morainic Deposits of the Waimakariri Valley', *Trans. Roy. Soc. N.Z.*, Vol. 68, 1938, p. 147.

Ablation moraine and other glacial deposits enclose three sides of Lake Sarah at the foot of Mount Sugarloaf, Cass. The west side is bounded by a small salient of the Cass River alluvial fan (*Fig.* 3).

Lake Blackwater. The undulating surface of an extensive terrace about 800 feet above the Waimakariri River opposite the Poulter and Esk junctions is dimpled by many kettle holes in ablation moraine and outwash gravel of Blackwater-II age, most of which are occupied by tarns in wet weather. Lake Blackwater is a permanent water-table lake at the southeastern end of the terrace (*Fig.* 4). It is uncertain whether the lake occupies a large kettle hole or merely an undrained original hollow between ridges and mounds of an end moraine marking the limit of the slightly earlier Blackwater-I advance.

'Non-glacial' Lakes: Pearson, Lyndon and Minchin. Lake Pearson is surrounded by postglacial alluvial fans, talus slopes and rock except for a small segment at the northern end where it laps upon the surface of glacial outwash deposits of Poulter age (*Fig.* 5). Its visible outlet, which forms the source of Winding Creek, normally carries less volume than the input from the Craigieburn River owing to seepage beneath the surface of the Craigieburn fan. This seepage reappears as a group of springs farther down Winding Creek. Lake Lyndon, practically on the boundary between the Waimakariri and Rakaia watersheds, is also retained by alluvial fans. Although both these lakes are situated in valleys formerly occupied by ice, the general direction of drainage flow is such that they would not exist were it not for the presence of alluvial fans of postglacial age. Lake Minchin, in the upper reaches of a branch of the Poulter River, is dammed by a large forest-covered landslide, probably of seismic origin. Further landslides occurred in the same area during an historic earthquake.[8]

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[8] R. Speight: 'The Arthur's Pass Earthquake of 9th March, 1929', *N.Z. Journ. Sci. & Tech.*, Vol. 15, 1933, p. 179.

AGES OF THE LAKES IN THE WAIMAKARIRI VALLEY

The lakes described above have existed continuously on the present sites for various lengths of time. None can be older than the middle of the Otiran Glacial Stage.[9] Blackwater, dating probably from the Blackwater-I advance, is the oldest; Hawdon and Marymere date from immediately after the Blackwater-II advance. Lakes have existed on the sites of Letitia, Grasmere and Sarah probably continuously since the Poulter advance. However, materials suitable for determining the absolute ages of glacial deposits by means of radiocarbon-isotope dating are unfortunately rare in Canterbury. A reasonable guess—based nevertheless upon tenuous internal and external correlations—would place the Blackwater advances between 22,000 and 17,000 years ago, and the Poulter between 17,000 and 13,000 years ago.

The alluvial fans damming Pearson may have been built mainly during the Poulter advance under cold, periglacial-climate conditions with sparse vegetation. Those impounding Lyndon may in part be even older, since this locality is not thought to have been subject to glacial conditions since before Blackwater times. On the other hand, all fans have probably grown to some extent in postglacial periods, some having received visible additions within the last hundred years. The Lake Minchin landslide need not be more than a few hundred years old.

Speight[10] and Gage[11] showed that several other lakes formerly existed in the Waimakariri montane valley in addition to the Lake Hawdon extension referred to earlier. It is also likely that during earlier stages in the glacial history of the valley there would have existed further lakes, the evidence for which could not have survived later glacial erosion and deposition.

OTHER CANTERBURY LAKES

In conclusion, and briefly glancing further afield, it appears that twenty-four of the forty-six lakes of significant size in Canterbury are certainly in the glacial class, and another eight are probably so, doubt attaching only to the extent of their dependence upon alluvial fans and

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[9] M. Gage and R. P. Suggate: 'Glacial Chronology of the New Zealand Pleistocene', *Bull. Geol. Soc. Amer.*, Vol. 69, 1958, p. 594. This is equivalent roughly to the 'last glaciation' in the northern hemisphere.

[10] Speight: 'Morainic Deposits . . . ' *op. cit.* p. 151.

[11] Gage: *op. cit.*, pp. 150 and 152.

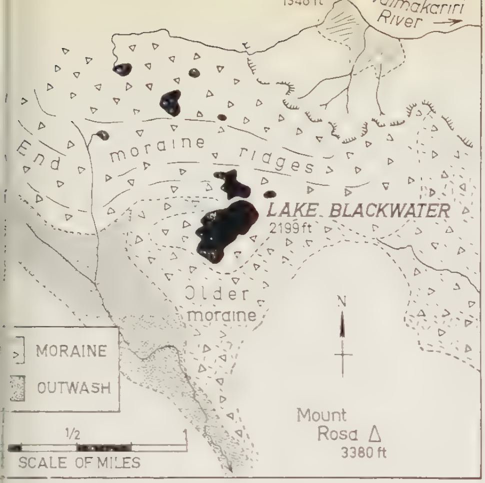

Fig. 4. Lake Blackwater

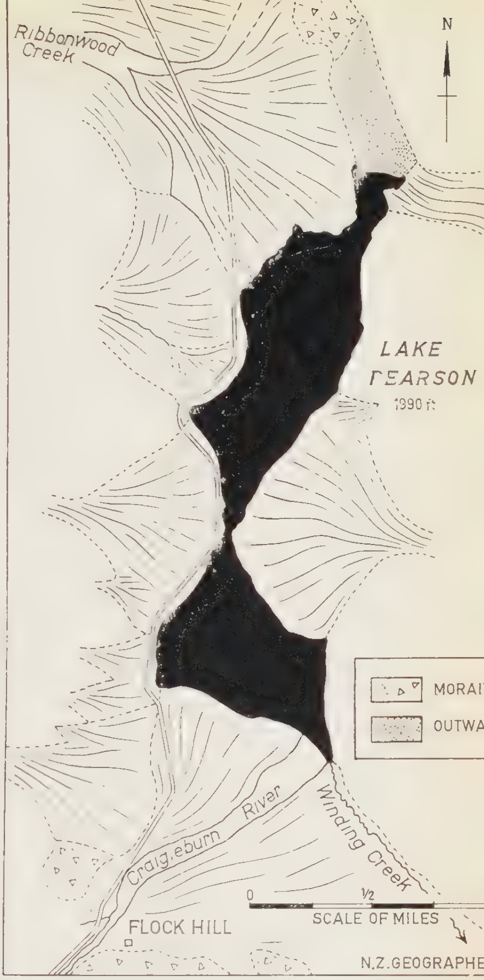

Fig. 5. Lake Pearson

the age of those fans. The remainder comprise eight coastal lagoons (including Ellesmere, the largest lake in Canterbury), four due to alluvial fans, one due to a landslide, and one large artificial lake (Waitaki). The preponderance of glacial lakes reflects the extensive glaciation of the region. Even the latest and feeblest major advance resulted in all valleys that extended back to the main divide being well filled with ice, and the snout of the Rakaia glacier reached virtually to the western edge of the plains.

THE DISTRIBUTION OF NEW ZEALAND RADICALISM: 1890-1957

HERBERT ROTH

RADICALISM is not easily defined. The radical of yesterday is frequently the conservative of today, and this does not apply only to individuals. Radical policies tend to become accepted and cease to be radical in any sense of the word.

For the purposes of this survey an attempt has been made to trace the fortunes of the most extreme radical organisation in existence at any period, with particular emphasis on the geographical distribution of its supporters. Individual radicals might be found anywhere, of course, but for a radical organisation to continue in existence for any length of time there has to be some basis for radicalism in the material conditions of the community.

The Liberals

In New Zealand, the four main centres with their growing working-class population were obvious breeding grounds for extremist organisations, but outside the main centres radical groups were of little importance in the first fifty years of New Zealand history. They were usually formed in support of a Liberal parliamentary candidate and they disappeared soon after the elections. Thus, Liberal Associations were reported at Thames, Napier and Oamaru in 1879, a Workingmen's League at Timaru and a Liberal Reform League at Blenheim in 1881, and a Workingmen's Political Association at Gisborne in 1884.

In 1889–1890, however, a new spirit reached New Zealand. 'Everyone,' wrote W. P. Reeves, 'was reading collectivist tracts and listening to altruistic sermons.' A 'wave of socialistic feeling,' as he called it,[1] swept over the country. Unions and trade associations were formed throughout New Zealand until, by late 1890, a trade-union membership of 60,000 was claimed. With a total population of 660,000 this meant that one out of every eleven New Zealanders was then an organised trade unionist—a proportion which was not again exceeded until the advent of compulsory unionism in 1935.

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[1] W. P. Reeves: *State Experiments in Australia and New Zealand*, London, 1902, Vol. I, p. 74.

The Knights of Labour

Trade unionists, of course, were not necessarily radicals, but hand in hand with the spread of unionism went the rise of a new political organisation, the Knights of Labour. The knights originated in the United States in 1869. They spread to a number of European countries but by the time they reached Australia and New Zealand they were already in decline in the United States and about to be supplanted by the American Federation of Labour.

Outwardly, the knights resembled masonic lodges. There was an elaborate ritual by which members were initiated, there were secret tests and passwords, and officials bore titles such as Master Workman, Worthy Foreman, Venerable Sage, Unknown Knight, and Outside and Inside Esquire. Membership was open to employers as well as workers, men and women alike, but three-fourths of the members of each Local Assembly had to be wage-workers or farmers. Lawyers, bankers, stockbrokers and professional gamblers were excluded from membership, and so was anybody connected with the liquor trade.

The knights' favourite mottoes were: 'An Injury to One is an Injury to All' and 'Agitate, Educate, Organise'. Much of their time was devoted to the political education of their members, and local assemblies were required to spend part of each regular session on the discussion of subjects such as 'Eight Hours', 'Child Labour', or 'How can the Toiler receive a Just Share of the Wealth He creates?'

First New Zealand Assembly

The first New Zealand assembly of the Knights of Labour was formed in Christchurch in 1887, but the real development of the order in New Zealand dates from the visit of an American organiser, W. W. Lyght, early in 1890. Lyght claimed that he established twenty assemblies in New Zealand, with 3,000 members. Late in 1892, a membership of seven to eight thousand in the North Island alone was mentioned, but this is almost certainly an exaggeration. The peak membership of the New Zealand Knights of Labour was probably 5,000 in more than forty local assemblies.

The geographical distribution of these assemblies is significant. The Auckland District Assembly comprised branches at Whangaroa, Aratapu, Te Kopuru (suitably named Hope of the North Assembly), Whitianga, Whangapoua, Tairua, Hamilton, Gisborne, Birkenhead, Chelsea, Newton and Auckland itself (*Fig.* 1). The country assemblies were formed from among timber workers, many of them employed by the Kauri Timber Company, and the knights were able to gain for them reduced working hours and other concessions.

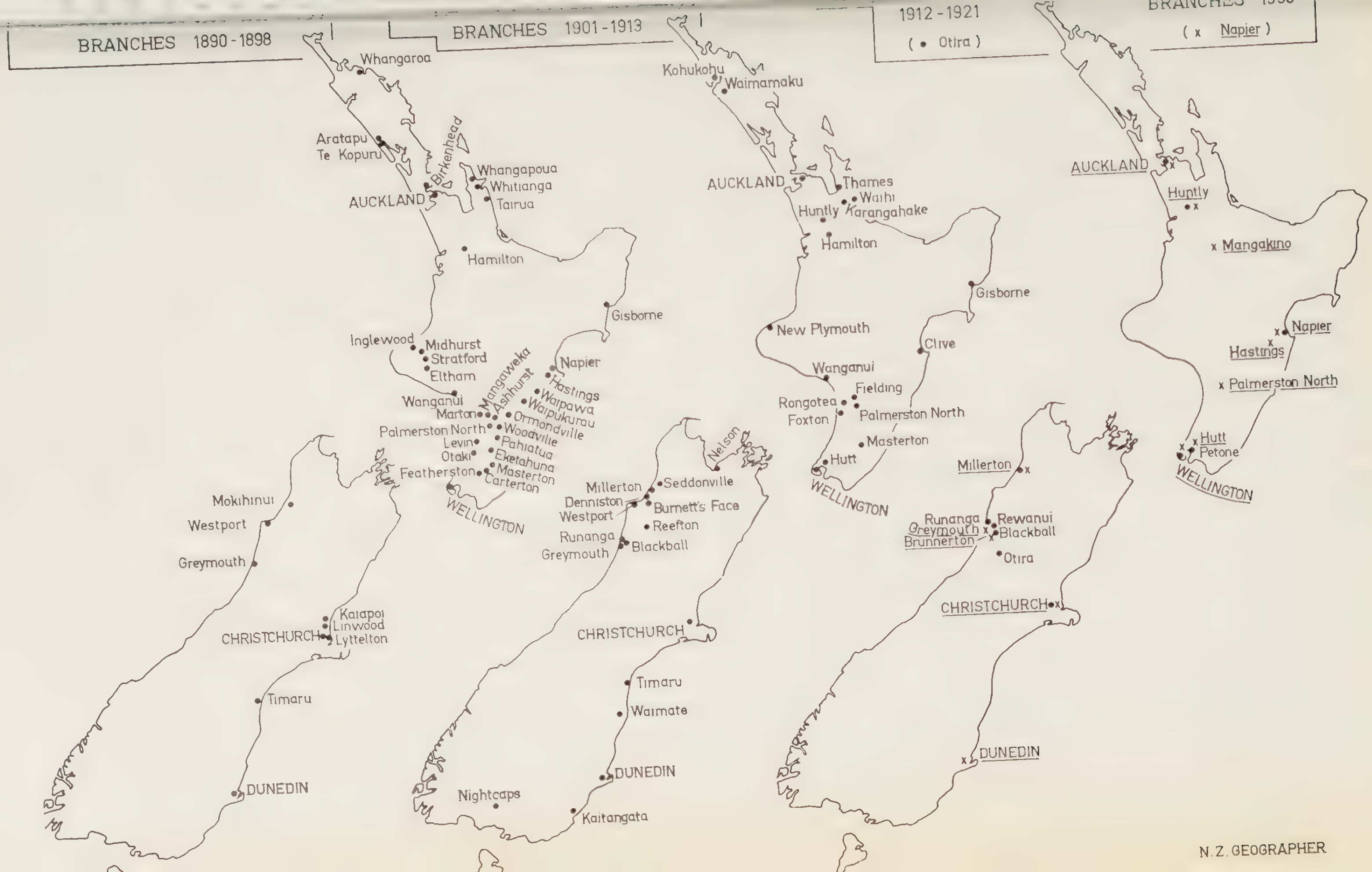
In the South Island, the knights were at first confined to Christchurch (with short-lived branches at Lyttelton, Linwood and Kaiapoi), Timaru and Dunedin. Their main strength was in the Wellington provincial district where, in the early 'nineties, there was hardly a township without its local branch (*Fig.* 1).

Ten members were necessary to form a local assembly, but the Confidence Assembly at Palmerston North, formed in July 1890 with sixty-one members, more than doubled its numbers within a fortnight, and the Success Assembly at Napier claimed 360 members in September 1892. A large proportion of members in the Wellington district were not wage-workers but small farmers and land-hungry country settlers. At a mass meeting of knights at Woodville, late in 1891, more than a thousand people from the surrounding districts attended and listened to speeches by John Ballance (the Premier), W. P. Reeves, John McKenzie and local politicians.

There is some doubt whether Mr Ballance himself was a member, but at one time fourteen members of the House of Representatives belonged to the order, including F. Pirani, the member for Palmerston North, and P. J. O'Regan, the member for Inangahua. On the West Coast of the South Island, which also belonged to the Wellington district, there were assemblies at Greymouth and Westport. The knights helped to revive the miners' union at Denniston, and a party of knights took over the Mokihinui mine and worked it on a co-operative basis.

Decline and Disappearance

In 1895, a National Assembly was set up for the whole of New Zealand but by this time the knights were already in decline. The long depression was passing and many knights had obtained land (the Palmerston North knights formed a Special Settlement Association and the Christchurch knights applied for a portion of the Cheviot estate). Timber workers in the Auckland provincial district and miners on the West Coast organised themselves into regular trade unions, and soon the knights were confined to the main centres. They were last heard of in 1898.



N.Z. GEOGRAPHER

Radicalism in the countryside was on the wane and small settlers transferred their allegiance to the New Zealand Farmers' Union which was formed in 1899. Mr W. F. Massey, an erstwhile Knight of Labour, became leader of the Conservative opposition.

THE SINGLE-TAXERS

Among the writers who greatly influenced the thinking of the Knights of Labour was Henry George, the American advocate of the single tax. George's book *Progress and Poverty* circulated widely in New Zealand and, in December 1887, George's followers in Auckland formed an Anti-Poverty Society. Branches were established at Cambridge, Pahiatua and Wellington, and from the West Coast of the South Island it was reported in September 1894 that 'single tax of a virulent kind still rages in Greymouth, and Henry George is having a large sale among the victims to the plebeian malady'.[2]

After 1895, the Single-Taxers, like the Knights of Labour, lost their influence in the countryside. Despite successive changes of name to Ground Rent Revenue League, National Single Tax League, and New Zealand Land Values League, the single-tax organisation remained confined almost entirely to the four main centres.

THE SOCIALISTS

In the late 'nineties the first Socialist groups were formed in New Zealand and, in 1901, there came into being the New Zealand Socialist Party. For several years this party was confined to Auckland, Wellington and Christchurch, and only in January 1906 were the first country branches formed, curiously enough at Kohukohu and Waimamaku in the far north. This Hokianga Socialist League owed its existence to the enthusiasm of a local teacher and went out of existence in 1908.

Of more lasting importance was the expansion of the Socialist Party to the West Coast of the South Island. In 1907 branches were formed at Denniston, Burnetts Face, Greymouth, Blackball and Runanga. The following year the expansion was even more spectacular, with branches at Waihi and Huntly, Gisborne, Clive, New Plymouth, Wanganui, Palmerston North, Rongotea, the Hutt Valley, Nelson, Reefton and Dunedin (*Fig.* 2).

Some of these branches were short-lived, but in the mining districts and at Wanganui, Palmerston North and Dunedin the party was able to maintain itself. In 1910, new branches were mentioned at Thames, Karangahake, Feilding and Masterton, and in 1912 a fresh organising effort yielded branches at Hamilton, Foxton, Millerton–Ngakawau, Seddonville, Westport, Timaru, Waimate, Kaitangata and Nightcaps.

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[2] *Otago Daily Times*, 22 September 1894.

Total membership of the party was given as 1,000 in 1912. Only in Wellington, Auckland and Christchurch did the numbers exceed the hundred mark. The Runanga branch, in July 1913, claimed fifty members, Foxton eighteen, and Feilding and Palmerston North twelve each. Outside the main centres the membership was concentrated very clearly in the mining townships of both islands. Other strongholds were the flax-milling districts in the Manawatu where Otaki, in 1911, elected the first Socialist to Parliament.

The Independent Political Labour League

The rival and more moderate Independent Political Labour League which flourished between 1905 and 1908 had, outside the main centres, branches at Karangahake, New Plymouth, Taihape, Midhirst, Wanganui, Petone, Ashburton, Timaru and Invercargill. It appealed primarily to skilled workers, and the branches at Midhurst and Taihape which were formed from among railway construction workers lasted for only a few months in 1905.

Marxists and Communists

In 1913, all Socialist Party branches with one exception joined a new Social Democratic Party which in turn, three years later, merged into the present New Zealand Labour Party. Leftwing opposition to this party crystallised at first in Marxist groups and study classes. The first of these was formed in Petone as early as 1912 and continued in existence throughout the war years. Its membership, drawn from the Woburn railway workshops and the Gear Meat Company's works, seldom exceeded the dozen mark.

During the war years Marxist study classes were formed among the West Coast miners and in Christchurch, and a first conference of marxist students, which met in Christchurch in December 1918, was attended by representatives from Millerton, Blackball, Runanga, Rewanui, Otira and Christchurch. An association was set up, with headquarters in Wellington, and relations were established with an Economics Class of Marxist Theory which had been formed among Huntly miners. Napier, at that time, had a Marxist Literature Bureau, and Auckland an International Socialist Club. In 1921, the various leftwing groups met in conference in Wellington and the New Zealand Marxian Association was transformed into the New Zealand Communist Party.

Figure 3 shows Marxist groups in existence between 1912 and 1921, and branches of the Communist Party today, as far as they can be ascertained from the party's publications. The coincidence is remarkable and the discrepancies are easily accounted for. At Otira, the Marxist group among tunnel workers disbanded after the completion of the tunnel. Recent big construction projects are those at Mangakino, Kawerau and Roxburgh, and Mangakino, at least, has an active Communist branch.

At Waihi, which does not appear on this map, the Socialists were bodily ejected after the defeat of the miners' strike in 1912. Radical influence slowly revived and a Communist branch was in existence until the closing of the Martha gold mine in 1954. Palmerston North had no Marxist group after the first World War, but radical influence was strong and a Labour candidate who stood as an 'International Socialist Student of Marx' almost won the seat in a by-election in 1918. New Plymouth, a town which only rarely appears on the radical map, had a short-lived branch of the Socialist Party in 1908.

RETROSPECT

Looking back over the years, it is clear that, outside the four main centres, there is a continuous tradition of radicalism only in the coal-mining districts of the West Coast of the South Island and, to a lesser extent, of the Waikato. Even among the main centres, there has been a significant shift. Dunedin was the undisputed headquarters of the New Zealand labour movement in 1890, but the Socialist Party was unable to form a branch there until 1908, and the first Communist Party group was not formed until 1923. Wellington, and for a time Christchurch, were the headquarters of the Socialist Party, but the Communist Party, since 1938, has had its headquarters at Auckland where its influence is strongest.

Some short-lived groups in the smaller centres can only be described as freaks—the Hokianga Socialist League of 1906–1908, for instance—or the ephemeral New Zealand Bolshevist Party which was formed at Foxton in 1939. Other organisations had a temporary basis, such as the Labour League branches among North Island railway construction workers in 1905, or the Marxist class among Otira tunnel workers in 1918. On the West Coast of the South Island, however, there is an uninterrupted chain of radicalism stretching back to the days of the Knights of Labour and, more tenuously, perhaps even to the 'Fenian Riots' of 1867.

Various reasons have been suggested for this phenomenon. Leaving aside 'foreign agitators' and alleged lack of perception among miners, it is interesting to find that one prominent New Zealander sought to provide a geographical explanation. 'The miners', said Mr W. Downie Stewart, 'live in isolated communities, have little contact with the rest of New Zealand, and their unions have always been singularly self-contained, virile and militant.' At the same time, according to Mr Stewart, the geographical character of New Zealand had helped to mitigate class conflict, for 'there has been no massing of population in huge metropolitan centres, and it is these overgrown cities that form such potent centres of organised discontent'.[3]

Geography undoubtedly played its part, but organised discontent is primarily caused by economic grievances. The radicalism of the small settlers in the early 'nineties which found expression in the spread of the Knights of Labour virtually disappeared under the impact of the land legislation of the Liberal government. The discontent of the industrial workers, on the other hand, was only softened by the Arbitration Act and protective labour legislation, and has remained a political factor to this day.

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[3] A lecture on 'Class Conflict in New Zealand' reported in the *Otago Daily Times*, 31 July 1919.

METHODOLOGICAL VIEWPOINT . . . .

1. *FOR GEOGRAPHY: A REVIEW AND COMMENTARY*

James W. Fox and G. R. Lewthwaite

FROM TIME TO TIME the Davids of the academic world take up their slingshots and attempt to expose the weakness of the Goliath, geography—the giant which apparently has grown far too big during the past twenty years or more. Pebbles of scorn, gathered from many streams, have been hurled from many quarters in the past, but on this occasion it is an academic of presumably wide views—an editor, no less—who, *en sens inverse* issues the challenge.[1]

THE ARGUMENT . . . . .

However, Tudor David does at least deserve credit for making his case 'against geography' explicit. It is, he asserts, a subject which has been forced upon reluctant universities by insidious pressure, and it is a subject which has no valid claim to acceptance as an honours discipline. Until recently there has been confusion and division among geographers as to the very nature of their subject—a confusion and division admittedly largely resolved by Hartshorne's *The Nature of Geography*, 'one of those massive, teutonic works which are at once impressive in scholarship and depressingly formidable reading'. This work reaches the conclusion that geography is the study of the areal differentiation of the earth's surface, both in systematic aspects and in regional synthesis, the latter being asserted to be 'the main object and justification of the exercise'.

. . . . . AGAINST SYSTEMATIC GEOGRAPHY

David then proceeds to dissect systematic and regional geography. The former is pilloried in the frame of questions taken from optional papers in the University of London examinations in order to stress one major point—that such geography 'is simply compounded of chips off a number of other blocks'. He goes on to argue that the approach to systematic studies in terms of 'a philosophy of place' . . . 'means, in practice, that the geographer would give some prominence to . . . features of the physical environment', and that such a philosophy has inherent dangers—and, in any case, these studies can be better made by exponents of other disciplines. Nor does this alleged difference of approach result in distinctive and discrete studies; the overlap is complete. Consequently the rigour of Hartshorne's logic is repudiated by 'all but the most devoted proselytes', and inevitably the systematic geographer flounders in 'deep and unfamiliar waters though he is not always aware of his unhappy plight'.

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[1] Tudor David: 'Against Geography', *University Quarterly*, Vol. 12, No. 3, May 1958, pp. 261-273.

. . . . . Against Regional Geography

Critical examination of regional synthesis follows—a theme which David claims has a 'religious significance' for geographers, despite the fact that such syntheses are apparently lacking, for even the better examples scarcely rise above the level of the school textbook. To David—and this forms the gravamen of his accusation—'there can be no such thing as a regional synthesis'. Historians—Burckhardt's *Civilization of the Italian Renaissance* is cited—have woven diverse threads into an acceptable synthesis, but such achievement has been possible because 'the stuff of this synthesis is, of course, humanity'. Area, the stuff of geography, cannot have binding properties 'because the data and the factors which bear upon it are too diverse and are not necessarily related to one another'. Furthermore, aesthetic and literary aspects are bound to be excluded. Thus 'the geographer making a regional study is forced to parade *seriatim* the facts of relief, climate, economic geography, etcetera, drawing attention where he can to related phenomena . . . There is no alternative; his material cannot be handled in any other way.'

Specific criticism is then made of *Wales: A Physical, Historical and Regional Geography*, edited by Professor E. G. Bowen, and, according to the critic, 'there is not a single chapter in the first half whose subject does not belong to some other discipline' and the regional synthesis repeats the pattern and fails 'to demonstrate a unique fusion of the facts', whilst the section on the South Wales coalfield could have been written by 'any intelligent, regular reader of the *Western Mail*'.

. . . . . Against Geography

Thus dismissed from higher academic standing, geography is commended to schools, or perhaps to first-year university studies 'as a subsidiary subject to the social sciences and to history'. It can go no further because 'it has no apparent distinctive purpose and . . . its claim to a "holistic" view of reality is no more than an academic masquerade'.

. . . .

Such is the charge, fairly summarised, and it may well make geographers catch their breath, for half-truths are commonly more damaging and more difficult to refute than outright falsehoods. One is irresistibly reminded of the college president who, on hearing an historian exclaim that 'the only thing that history teaches us is that history teaches us nothing', promptly dismissed the historians. Surely self-interest would caution the critic who adopts the techniques of damning other subjects with tendentiously-selected excerpts: there are too many perilous possibilities! But, if any case is to be made out against geography, it should surely have been supported by a wealth of evidence—evidence which would have demonstrated significant research and which would have illumined the critic's qualifications for making his statements. As it is, the sources quoted are few: Wooldridge, Debenham, Hartshorne and Pye, with passing references to Darby, Bowen and the late Wilfred

Smith. In the attempt to damn geography by the utterances of geographers, statements have been taken without reference to context, time or place, and nothing has been included from the supposedly non-existent magistral works of French, German, and other geographers.[2]

ARGUMENT AMONG GEOGRAPHERS

David is perfectly right in pointing to the controversy within and around the subject, but surely this need not be interpreted as self-condemnatory. Conflict of opinion is not necessarily an index of disciplinary ineptitude, and he would indeed be a rash man who claimed that all geologists, chemists, physicists, botanists and zoologists maintained identical viewpoints. More so, then, are divergences likely to occur among 'social' scientists, including historians,[3] who are concerned with Man, the complex, the unpredictable, the incommensurable. To pursue methodological argument; to investigate, criticise and chasten accepted ideas; and to appreciate such disputation as part of the discipline implies that considerable significance is attached to the subject and to the problems which inevitably arise where significant themes are analysed. In this respect geography is analogous to a number of other studies, such as philosophy.

It is true enough that dispute about the fundamental *purpose* of a discipline—as distinct from inevitable differences of interpretation—is perhaps symptomatic of a measure of immaturity sometimes attributed to subjects newly-introduced to traditional centres of learning. It is no less true that geographers wish they could wash their domestic linen without unfriendly neighbours making comments from over the fence. But who among geographers would maintain that, by and large, more has not been gained than lost by methodological argument, and who among them regrets the sharper insight and clearer sense of purpose which has been emerging? And, after all, such disputes should not be exaggerated nor misinterpreted, for, in the very nature of things, broad areas of agreement are less conspicuous to the onlooker than are points of dispute. So often in the past, and even occasionally today, geography was defined, with frank subjectivism, as 'what geographers do'. However, the age of innocence had to end, and the very fact that the subject has been recognised more widely in the universities has forced more incisive self-criticism and a measure of controversy upon geographers. Thus it has been only recently that the present fashion of inaugural addresses as so many *apologiae* has become established among British geographers,[4] and if controversial points in these are taken by outsiders as evidence of disagreement among geographers as to the nature of their subject, it must be remembered that they are cases of special pleading on very particular occasions.

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[2] It is inconceivable that any scholar discussing the nature of geography and the worth of the subject should omit reference to Vidal de la Blache, Hettner and Preston James, for example.

[3] A nice point here is that to David history is acceptable as a university discipline at the honours level. But it, too, has proponents with different ideas; it 'dabbles' in other fields—economics, politics, philosophy and the like; and it has authorities who make *ex cathedra* pronouncements. History and geography are as one in that both deal with the same elements, the one in time-relationships, the other in space-relationships.

[4] There are exceptions, of course—among them most recently the inaugural lecture of Fisher at the Durham Colleges.

Achievement of 'Academic Respectability'

Nevertheless the comparative recency of these inaugural lectures does bear out David's contention that geography has been accepted only tardily as a university discipline worthy of honours status. But to labour this point does not advance the argument, because geography is not alone in this respect and because it is not the fault of geography that this may be so. The subject has a long university tradition behind it—to Ritter at Berlin in 1820 and, as far as Britain is concerned, to Mackinder at Oxford in 1887. To instance the 'full recognition' of geography at Oxford and Cambridge in the 1930's as stamping the seal of respectability does savour a little too much of intellectual snobbery. Furthermore, to quote Wooldridge[5] and Debenham[6] when they emphasise that geography was forced upon the universities is less than honest unless it be also pointed out that Wooldridge was addressing schoolteachers and congratulating them on their work in laying the foundations of the discipline and that Debenham was writing the introduction to a popular series of texts on geography.

It is much more significant to appreciate that the period after the first World War, when geography began to come so rapidly to the fore, was one of rapid expansion in education. At this time global events had made a profound impression on academic as well as popular minds, and it was only natural that interest should develop in a subject which could help to elucidate the world and its problems. The alternative to the recognition of this growing interest was to perpetuate the role of universities as ivory towers—ivory towers that up to that time had been mainly the prerogative of the privileged. It could be argued that had geography been fully recognised earlier in the universities, and had it achieved the status of its intellectual counterpart, history, perhaps that same history would not have been 'too well remembered' in 1919 and perhaps the *damnosa hereditas* of the postwar Europe would not have appeared. How right was Wooldridge when he said that 'the latter-day rise of geography is one of the few signs of dawning sanity in an educational wilderness of atomistic specialisation'.[7]

It is interesting to ponder on how much pressure is today being brought to bear on the universities to cater, also at honours level, for the social sciences that have come to the fore as the result of developments during the periods following the depression of the 'thirties and the war of the 'forties. Is the situation so very different from that of geography a generation ago? On the other hand one notes the present proliferation of Chairs in pure and applied science. Chemistry, physics and engineering divide and subdivide as the fields of knowledge widen and the demand is created for more and more experts. Where lies the sanction for this, and whence comes the pressure for its recognition? Is it not in the questing of the human mind and in the appreciation of economic and social realities? The pressure for academic geography originated in much the same way—the demand was a prelude to the supply. If such questing is to be worthwhile, is to be guided and is to be developed, the universities must surely recognise their responsibilities.

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[5] S. W. Wooldridge: *The Geographer as Scientist*, London, 1956, p. 26.

[6] F. Debenham: *The Use of Geography*, London, 1950. This is the introductory volume in the series *Teach Yourself Geography*.

[7] Wooldridge: *op. cit.*, p. 19.

THE NATURE OF GEOGRAPHY

David then proceeds to tilt at the windmill of *The Nature of Geography*.[8] As more than one geographer has pointed out, Wooldridge included, one need not agree with Hartshorne to recognise in this monograph a notable contribution to the philosophy of the subject. Its impact was to make many aware of their 'culpable ignorance' of the *literature* of geography,[9] not its *methodology* as David suggests, and no one who pretended to scientific objectivity would accept it as a 'new Koran'.[10] Hartshorne would be the last to expect this, but perhaps in the world of Education such *chefs d'oeuvre* are regarded with religious awe. Pye,[11] in his inaugural address, does certainly condemn the shibboleth, 'areal differentiation'—but so would Hartshorne in such a context, for areal differentiation is the end product, the 'ultimate purpose' and not the means to the end.[12] Thus Pye errs when he deplores a geography circumscribed by the 'selective hunt for some indices of regional differentiation'.[13] Hartshorne emphasises as the basic concept, 'the totality of related features',[14] and as the purpose, the comprehension of this totality in order to understand how places differ; whilst Pye himself later states that 'the common reference that unifies and informs the study [geography] is the total area, and thus is created a deeper understanding of reality'.[15] In other words, Pye follows substantially Hartshorne's philosophical arguments, as do many other geographers, among them Wooldridge, when he asserts regional geography to be the central objective of geographical study.[16] In New Zealand, geography has been defined by Cumberland as 'the study of what places are like',[17] and by Fox as 'an appreciation of place',[18] whilst others, not so specific in the areal context, have always emphasised the interrelatedness of phenomena. So the examples could be multiplied.

It is patent, then, that there is a wealth of evidence to show that geographers, in the main, recognise areas as their objective of study, although there may be disagreement as to the approach to be employed. As Tudor David admits, there is now substantial central agreement: the arguments are really circumferential and in no measure invalidate the claim of geography to status as a major university subject, for similar conflicts of ideas appear in other 'established' and 'traditional' disciplines.

THE SYSTEMATIC APPROACH

The central objective—the study, analysis and understanding of area in order to appreciate areal differentiation and spatial relationships on the earth's surface—may, however, be approached in two ways: systematically in terms of particular phenomena, or regionally in terms of the totality of phenomena. Each is equal in dignity and similar in purpose though it is obvious that the analytical nature of systematic studies implies a certain propaedeutic quality *vis-à-vis* the synthesis of regional geography. But the main point is that both types of study are chorological, and it is in this way that the geographer makes his unique contribution to knowledge. David, it would appear, has not read Hartshorne carefully enough, and roundly condemns systematic geography on the flimsy evidence of the over-brief, trite and simplified wording of examination questions. Moreover he is still saddled with the common misapprehension that geographers must give a dangerous prominence to the influence of the physical environment—a misapprehension which might be dissipated by a second reading of the few sources David cites.

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[8] R. Hartshorne: *The Nature of Geography*, Lancaster, 1939, (lithoprint).

[9] See Wooldridge: *op. cit.*, p. 20.

[10] This is no reflection on Hartshorne's monograph, but merely to point out that no single work can be accepted as the ultimate of truth.

[11] N. Pye: *Object and Method in Geographical Studies*, Leicester, 1955, p. 7.

[12] Hartshorne: *op. cit.*, p. 468.

[13] Pye: *loc. cit.*

[14] Hartshorne: *loc. cit.*

[15] Pye: *op. cit.*, p. 9.

[16] Wooldridge: *op. cit.*, p. 51.

[17] K. B. Cumberland: 'Why Geography?', *N.Z. Geographer*, Vol. 12, No. 1, April 1956, p. 3.

[18] J. W. Fox: 'Geography in Schools, An Examiner's Viewpoint', *ibid.*, Vol. 10, No. 2, October 1954, p. 165, and *idem:* 'Geography in New Zealand, A Methodological Appreciation', [N.Z.] *Education*, Vol. 7, No. 3, 1958, p. 44.

Must geographers be driven into saying, with almost banal simplicity and wearisome repetition, that they have to do nothing of the sort? Of course geographers have often, and rightly, perceived the influence of the earth-environment, and some geographers have undoubtedly exaggerated such influences, but their severest critics are their own colleagues. Normally physical features are of significance in assessing areal relationships and character, but surely one knows by now that they are only part of a whole range of phenomena, including historical circumstances, that must be taken into consideration. It is quite conceivable that such physical features may play an insignificant role—as, for example, in particular studies in political geography. In other words, geography is not 'lopsided'. Geographers must consider everything that is relevant to the problem under study, and in so doing they often elucidate factors sometimes neglected by other disciplines. In this respect David rather gives away his case when he notes that the historian may neglect the physical environment,[19] and it is worthwhile to note that Freeman has shown how planners have had 'little appreciation of such fundamental physical factors as relief' in drawing up their schemes.[20]

Geographers in Other Fields

David also betrays the uncomfortable truth in stating that geographers such as Darby, Wooldridge, Smith and Bowen have 'done some notable work', but by asserting that their efforts properly belong to other disciplines he starts the hare of geographers working in specialist fields where their studies happen to overlap. But does it not reveal a 'culpable ignorance' of the nature of geography to claim that 'there is just no radical difference between the general nature' of Darby's Domesday England and the work of Beresford and Hoskins?

The crux of the matter here is the differentiation between the fields of geography and history. According to Kant, and later to Hettner, geography is concerned with that part of reality where phenomena have arrangement and division on the earth's surface, whilst history is concerned with development through time.[21] Granted this premise, Hoskins's *The Making of the English Landscape* is, as its title implies, history, but Darby's *Domesday Geography of Eastern England* is geography—an 'historical' or 'past' geography, it is true, since it represents an interpretation of the character of a landscape at that period of time.

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[19] On the other hand he may give it undue weight, as Toynbee may have done in his *Study of History*.

[20] T. W. Freeman: *Geography and Planning*, London, 1958, p. 13.

[21] See the translation of Hettner quoted by Wooldridge; *op. cit.*, p. 9, and R. Hartshorne: 'The Concept of Geography as a Science of Space, from Kant and Humboldt to Hettner', *Annals Assoc. Amer. Geogrs.*, Vol. 48, No. 2, June 1958, p. 97.

The second issue raised by David is that of geomorphology, and he quotes Wooldridge with glee. Here one may argue with Wooldridge who states that 'the essential truth of Hettner's thesis is not to be gainsaid' and at one and the same time advocates a genetic approach to the study of landforms.[22] The evolutionary aspects of landforms are the content of history—geological history—if Hettner's appreciation of reality is not to be gainsaid, but geomorphology interpreted this way is not to be disregarded by the geographer.[23] Just as in any *interpretation* of the present-day landscape a geographer may have recourse to history, so in the explanation of the differential character of present-day landforms the story of their evolution will be relevant.[24]

This raises the whole question of the desirability, or even the propriety, of geographers working in related fields. The answer is simple. Truth is universal and, in seeking the answer to problems of 'areal differentiation' one must follow the evidence wherever it may lead. If the geographer has the requisite training in his own or related fields, well and good; if he needs to consult another specialist, he may surely do so without apologetic blushes. He should, indeed, invite the cooperation of the systematic scientist or historian and, putting aside false modesty, assert that they might gain by consulting him. In the nature of the case it should be so because the geographer as such can claim special competence in one regard only—that of his chorological view of the earth's surface. The others consider reality in a different way and use their findings for different purposes. Hence the distribution of agricultural elements, which David implies should be studied by agriculturalists rather than geographers, may be examined—with mutual benefit—from both viewpoints. In an analagous way, agriculturalists and historians are interested in agricultural history.

It may so happen that the geographer, pursuing his studies to their logical end, finds that a related systematic field, or the facts of history, have not been fully explored. Under such circumstances he is entitled to enter these fields in order to achieve complete understanding and intellectual satisfaction, and to this there can be no objection 'so long as the geographer is competent to work in [those fields], so long as he recognises that he has transgressed a boundary and that he must eventually return to his own field, and so long as he regards his findings as tentative, to be revised and modified in the light of subsequent investigations'.[25]

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[22] Wooldridge: *op. cit.*, pp. 10 and 398.

[23] In this analysis a rigidly logical cleavage between temporal and spatial studies is assumed. Given that division, it is clear that all developmental studies, including the development of landforms, are of necessity historical rather than geographical. Nevertheless many geographers, refusing to embrace this rigorous doctrine—at least without some qualification—and with abundance of precedent, maintain that though geography is unique in its concern with the areal differentiation of landforms, it shares with geology an overlapping interest in their evolution. This viewpoint is, in fact, at least suggested by such exponents of the chorological approach as Hettner and Hartshorne (Hartshorne, *op. cit.*, pp. viii, 210, 307, 423), whilst the central concern with the varied character of the earth's face is quite generally accepted as the major centralising theme.

[24] See the discussion between Cotton, Baulig and Wallace in *N.Z. Geographer*, Vol. 12, No. 1, April 1956, pp. 89-93.

[25] Fox: 'Geography in New Zealand . . . . .', *op. cit.*, p. 45.

The Regional Approach

Finally, David raises the issue whether regional geography constitutes a vindication of geographical study previously attentuated by the elimination of the systematic aspects. Here again it is evident that he does not fully appreciate what regional geography is, but one can sympathise with him as he asks, with Wooldridge, 'where are the great magistral books on regional geography?'[26] Geographers are often their own severest critics—as indeed they should be—and one must acknowledge that British geographers in particular have failed to produce full and satisfying regional studies. Mackinder's *Britain and the British Seas* is always quoted as a good example, but that was published in 1902, and since then only two major regional geographies of the British Isles have appeared: Demangeon's *Les Iles Britanniques* in 1927 and Solch's *Die Landschaften der Britischen Inseln* in 1951.[27] But it might have been well, before condemning regional geography, if David had examined the works of French, German and American geographers—de Martonne's *Europe Centrale*, cited by Wooldridge, to quote but one example. Trenchant criticism is easy when phrases are divorced from their context, and one could, as David's comments suggest, belittle the quality of Burckhardt in such a way and so confound the critic himself.

It is obvious, and rather pathetic, that David has been misled by the apparent simplicity of language which may accompany and illuminate good regional description. Richthofen long ago pointed out that geography and history are both handicapped by the fact that the clarity and simplicity with which results may be expressed obscure the labour and insight that has gone into the discovery of the facts. A map, for example, is all the better for simplicity and clarity, but these very qualities may conceal from the uninitiated the penetrating and thorough research which entered into the collection and collation of the essential data. Moreover geography is not merely description. If it were, one would agree that it is unworthy of a place as an honours discipline and should be relegated to the school. As emphasised earlier, geography is an appreciation of place in every sense of the word. In the light of the problem posed, the phenomena within the area must be described in terms of their inherent characteristics, their interrelatedness must be understood, and an assessment made as to how they give character to the area. So is appreciated the peculiarity of the area, so is its distinctiveness recognised and so is it differentiated from other areas.

Areal Association of Phenomena

This, then, is the synthesis which David says is impossible—the crucial issue in his denigration of geography. If by his use of the term 'synthesis' he means that the factors which bear upon places must form an interlocking and closed circle of cause and effect, then he will find himself in agreement with geographers. Rocks and rainfall may have no causal connection or areal coincidence, but climate and vegetation, or a culture-group and the resources it values, may be closely linked and their areal patterns may express very critical and delicate adjustments. They may also express serious maladjustments, with which the geographer is equally concerned. But granted the factors may be 'diverse . . . and not necessarily related to one another', to use David's words, they remain related to and find expression in the character of places. Every area surely shows a unique *association* of the facts, even if terms such as 'fusion' and 'synthesis' may be misconstrued.

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[26] Wooldridge: *op. cit.*, p. 62.

[27] *Great Britain: Essays in Regional Geography*, edited by Ogilvie and published in 1928, is not included here since it embraces a series of contributions which have no central methodological or philosophical aim, and it was designed for a specific purpose. Also Fawcett's series, *The Provinces of England*, is omitted because it was never completed.

After all, geographers are not striving to press the actuality of the earth's surface into a forced and artificial synthesis, they simply accept the synthesis (or association) of varied elements which reality presents, and which only perverted ingenuity could deny. If individual geographers fail to elucidate this association, that is surely their fault and not that of the subject. Even were it to be conceded that geographical syntheses, by their inherent nature, can never compare with historical syntheses, it might not be amiss to point out that the work of historians as well as geographers has at times been vitiated by efforts to create syntheses by undue compression of the facts, even to the point of deducing the varied facets of human life from one primary determinant. Environmental determinism in geography finds some illuminating parallels in economic determinism among historians.

David's further criticism that the geographical 'synthesis' necessarily excludes the aesthetic and literary facets of human life scarcely requires comment. The geographer has enough to do, and to appreciate this David should again take Wooldridge's advice, this time to 'go once more into the field and savour once again the unity of man and nature and the correlation between physical and social phenomena . . . and to realise anew that the proportions and relations of things are as much facts as the things themselves', and so realise that 'unless [the geographer] studies them, no one else is likely to do so.'[28]

Nevertheless it must be admitted that many so-called 'regional' geographies written in English have failed to recognise that it is the totality of interrelated phenomena, insofar as these phenomena are relevant to the recognition of areal distinctiveness, that is important. Geography, as Vidal de la Blache has pointed out, is the art of not dividing what nature has put together, and to write a regional geography under headings that follow the traditional sequence from relief to communications may well negate the central purpose and function of geographical study. The regional geographer is not 'forced to parade *seriatim* the facts of relief, climate, economic geography, etcetera'; that British geographers have often done so in the past means that perhaps a better understanding of methodological writings is to be desired, but essentially it is a matter of a sense of purpose nourished by a literary tradition. Thus if geography were to be banished from the universities, or permitted merely a secondary role, the ineffectuality that David complains of would be perpetuated.

David's suggestions that because handicrafts are taught in schools a demand might be created for them in the universities—so implying a parallel between handicrafts and geography—and that accordingly, 'secondary schools should find their geography teachers from graduates who had read economics, sociology or history', with some subsidiary geography, are also worthy of comment. It is surely specious to argue that geography is comparable with handicrafts which are more appropriate to secondary schools—a field of learning is surely to be differentiated from a practical technique. And one shudders at the thought of adding to the numbers of discontented graduates who have sunk their intellectual capital in, and drawn their interest from, one subject only to find themselves forced to teach another. Who would wish for such teachers for their children? Not only would the quality of secondary school geography inevitably deteriorate, but whence would come the matured scholars who 'think geographically'?

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[28] S. W. Wooldridge and W. G. East: *The Spirit and Purpose of Geography*, London, 1951, p. 165.

CONCLUSION

In conclusion let it be said that it is futile to criticise geography unless the literature of the subject has been thoroughly studied; that it is dangerous to suggest often highly subjective criteria for the inclusion or exclusion of any discipline as a university subject; and that any subject stands or falls by the efforts of its exponents. As should be well known in university circles, there are few tasks more thankless than the attempt to transmit one's appreciation of a subject to an outsider: the most sagacious historian will derive little but frustration from an effort to impart his enthusiasm and insight to the mechanic who dismisses history as 'bunk'. Likewise the enrichment imparted by the study of geography is best appreciated by those who teach and do research in it. Such acquaintance generates its own convictions.

Nevertheless the criticisms of Tudor David are a blessing, albeit heavily disguised. The intended condemnation, admittedly containing elements of unpleasant truth, should be taken in the spirit in which it was not meant, and should be regarded by geographers as a challenge to show their faith by their works. That fact faced, it is contended, following Wooldridge, that 'geography still stands where it did, seeking to maintain its distinctive point of view, [and] it is little minded to be driven into diffident retirement again, by criticisms, often ill-founded',[30] and that as far as the geographer is concerned 'his subject, no less than others in the curriculum, subjects him to a discipline and yields him a philosophy'.[31]

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[30] Wooldridge: *op. cit.*, p. 25.

[31] Wooldridge and East: *loc. cit.*

GEOGRAPHIC NOTEBOOK

IN THIS ISSUE. Three years ago the New Zealand Geographical Society had the honour and privilege of publishing the Presidential Address delivered to the First New Zealand Geography Conference by Professor Kenneth B. Cumberland. Now that of Professor George Jobberns to the second conference is recorded; and in publishing this address the Society pays its corporate tribute to a man who has done so much for geography in New Zealand. For, like Wolsey,

He was a scholar, and a ripe and good one;
Exceeding wise, fair-spoken, and persuading.

Professor Jobberns occupies the Chair of Geography in the University of Canterbury.

Two of the articles which follow deal with phenomena of physical geography. One of them, that by Dr Maxwell Gage, Senior Lecturer in Geology in the University of Canterbury, was presented as a paper at the conference, and many readers, remembering Collet, will be interested to see this revival of interest in the origin of lakes. Mr J. D. McCraw, who is an officer of the D.S.I.R. stationed at Alexandra, writes of some striking periglacial features in the high country of Otago.

Both Mr M. G. A. Wilson and Mr. G. Fielding are former students of the Department of Geography, University of Auckland, the former now a Lecturer in Geography at Newcastle University College, New South Wales, and the latter at present undertaking postgraduate work in the University of California at Los Angeles. Mr Wilson's interest in coal mining stems from research undertaken in the Waikato coalfields for his masterate thesis, and it is encouraging to note the extension of his researches to the coalfields of the lower Hunter Valley. Mr Fielding's account of orcharding in New Zealand is based on his masterate thesis presented in 1957.

The short article by Mr Roth of the National Library Service lies on the border of history and political geography, and contributes to the understanding of the present politico-geographic character of parts of the dominion.

Finally, a new series makes its appearance—that of viewpoints on the scope and content of geography. This first contribution by Mr James W. Fox and Dr G. R. Lewthwaite, both of the University of Auckland, is by way of an editorial response to Mr Tudor David who can see little virtue in geography as a university discipline. It is high time this bogey was laid for ever. Subsequent articles in this series will deal with general and particular aspects of the field of geography.

The notes, commentaries and reviews in this issue are the work of Professor V. J. Chapman, and Messrs B. H. Farrell and Stewart Cameron of the University of Auckland; Professor D. W. McKenzie of the Victoria University of Wellington; Mr W. B. Johnston of the University of Canterbury; Dr C. A. M. King of the University of Nottingham, and Mr J. S. Duncan of the University of Manchester; Miss A. M. Gorrie of the Auckland Teachers' College; Dr Joan Metge, Mr K. A. Hart and Mr C. M. Herbert of Auckland; Mr L. S. Suggate of Christchurch; Mr T. E. French of Dunedin; and the editors.

THE SECOND GEOGRAPHY CONFERENCE: There can be few who attended the second triennial conference of the New Zealand Geographical Society who did not leave well satisfied with the intellectual fare offered, with the contacts made or renewed, and with the smooth efficiency with which it was run. The number who attended threatened on occasion to tax the capacity of the new lecture hall in the Canterbury Museum which was a most suitable venue for all official sessions of the conference. As in 1955, it was gratifying to see the interest taken by representatives from government departments and local bodies.

It should be remembered that this was the Society's second conference and the Christchurch committee could draw on the previous experience of Auckland. It was decided to conduct the conference in one division and to limit the number of papers presented. This had the very desirable effect of enabling the organisers to accept only papers of the highest standards, but it also had the unfortunate effect of narrowing the scope of the conference. It seems unfortunate that our geographers are apparently neglecting in their research the Pacific rim of Asia, the area that will so obviously be our concern in the coming decades. In this light Mr Krenek's paper on 'Changing Patterns of Life in India' was an important contribution. But there were some excellent contributions to several branches of systematic geography, particularly in land utilisation, historical geography, urban geography, climatology and geomorphology.

A valuable series of three papers on aspects of urban geography showed the rapidly-growing interest in this branch of the subject. Particularly important was Mr. A. G. Anderson's analysis of changes that have taken place in the functional areas in the heart of Palmerston North. Miss J. McKenzie described the changes of the last decade in the Porirua Basin, and showed how, for good or ill, modern earth-moving machinery can be used to modify steeply-gullied hill country and so make it available for high-density housing. Miss N. Northcroft, the Christchurch Regional Planning Officer, analysed the problems of the city of Christchurch from a planner's point of view.

Land utilisation and allied studies were rightly accorded an important place. Mr R. C. Stuart delivered a carefully-planned paper on irrigation in Canterbury. Projected schemes would irrigate a further 500,000 acres on the plains and, assuming the full use of irrigation water in these areas, very considerable increases in production could be expected. In a contrasting paper Mr L. Curry presented a statistical analysis of some climatic factors affecting pasture growth on the Canterbury Plains. This study made it clear how few precise facts have been gathered on this subject and gave a glimpse of how valuable such knowledge might be. Canterbury was again the subject of study in a paper on forestry and land use by Mr A. P. Thomson. Geographers hear too little of the work of the forester, one of whose tasks is to ensure an adequate supply of timber and forest products and to plan planting programmes to cater for future needs.

For some years now geographers from the University of Auckland have been studying the New Zealand Island Territories and particularly Western Samoa. Some accounts of the fieldwork done in this area have already appeared in the *New Zealand Geographer*, and the two papers by Mr P. Pirie and Mr B. Farrell showed the high standard and the real value of this work. With Western Samoa moving rapidly to self-government and beginning to feel the dual impact of a fast-growing population and a fall in export prices, a wise administration will not fail to use the wide body of factual material that has been so painstakingly gathered.

To many people present, the climax of the conference came with the Presidential Address to the Society by Professor Jobberns. He gave a critical appraisal of geography in New Zealand as he has seen it develop and as he sees it today. He strongly criticised any suggestion of academic intolerance, vigorously supported the right of the geographer to turn when necessary to the systematic sciences, and stressed the value of a thorough training in physical geography. It is to be hoped that in our schools teachers will give consideration to his suggestion that, in our preoccupation with regional studies, we may be dangerously neglecting the elements which are part of every region. Professor Jobberns's own happy personality, his breadth of view and his success as a founder of university geography in New Zealand gave much weight to this important address.

Professor J. MacDonald Holmes, well known to many New Zealand students, delivered a memorable paper on the Australian Flying Doctor Service. The way that this service has defeated distance and, through its wide radio network, created a spirit of communal interest in the Australian 'outback' was vividly described. A unique set of slides showed the landscape contrasts in this vast area.

Not all the business of the conference was confined to academic papers and discussion. Several field excursions were organised. Separate groups studied the site of Christchurch, the nature and growth of its industry, and the problem of urban sprawl. One group traversed the North Canterbury plains and downland area while two others visited the high country and saw some of its problems there. At the conclusion of the conference a party completed an east-west traverse of Canterbury to the Westland border and en route learned something of the vagaries of the high country weather. Three impressive displays were part of the conference. At the university there was a display of maps from many parts of the world. Particularly impressive were the huge Russian soil and vegetation maps, and the set of fine Japanese maps was of unusual interest. At the teachers' college there was a display of geography texts, teaching material and class work. So there was something for all. The quality of the material presented to the conference was undoubtedly high. But perhaps the greatest good will have come from the meeting of friends and colleagues, from the quiet discussion of problems, and the new contacts made during the conference week.

—K. A. Hart

GEOGRAPHY AT A.N.Z.A.A.S., 1958. New Zealanders were not numerous in any section of the thirty-third congress of the Australian and New Zealand Association for the Advancement of Science which was held in Adelaide in August 1958, though six of the sixteen section presidents were from New Zealand. This small total representation was doubtless related to national financial stringency and distance, but the geography section was particularly affected by the unfortunate, though apparently unavoidable, coincidence with the geography conference in Christchurch.

There was a notable interest in current problems associated with the expanding population and economy of Australia, an interest reflected in the papers on population distribution and population changes in the commonwealth and New Guinea, on the postwar influx of migrants, on the functional divisions and patterns within Australian cities, on regional variations in building materials, and on summer temperatures in a variety of house-types. Agricultural geography was represented by a symposium on 'Undeveloped Australia' as well as in papers on the Hunter Valley, the role of water supply in southeastern Australia and Queensland, and by a comparison of the 'wheat frontiers' in South Australia and the northwestern United States. Industrial studies included the Port Kembla complex, the copper-smelting centre of Queenstown, Tasmania, and oil refining in the continent. Other papers touched upon Torrens's lost map, the use of colour in cartography, and features such as the Lake Eyre depression. In the systematic field, some aspects of arid climates and of soil temperatures were examined.

Although the programme was largely oriented towards Australia, New Zealanders present opened up other themes. In his Presidential Address, Mr R. G. Lister delineated regional divisions of 'Landscape and Economy in Southern New Zealand', Professor C. A. Cotton compared the fine and detailed dissection apparent in New Zealand landscapes with the coarser patterns of the North Atlantic margins, Mr R. G. Ward analysed village agriculture in Fiji, and Dr G. R. Lewthwaite compared Polynesian agriculture in Samoa and New Zealand.

This wide range of papers inevitably varied in quality of content and of presentation, some reflecting very careful and painstaking work on themes of significance, others being much more restricted in depth and stage of completion. Some defects could be eliminated in future. In contrast with the practice adopted at the 1957 Dunedin meeting, and in some other sections at Adelaide, geographical abstracts were standardised in neither format nor content, and an unbound sheaf of reports ranged from full papers to meagre sentences which could hardly be supplemented from a memory crowded by a succession of papers. Furthermore, the full A.N.Z.A.A.S. programme was conspicuous for its clashes. But much of real value was given and received, and the conspicuous success of the geographical-economic-zoological symposium on world population indicated the advantages of coordination and cooperation. There was, it seems, real merit in the plan adopted by some sections which heard specialist papers before A.N.Z.A.A.S., and combined with other groups during the congress. This would be in accord with the viewpoint strongly urged by Professor Marcus Oliphant in his Presidential Address to the congress, that A.N.Z.A.A.S. should seek to fulfil its original purpose of acquainting laymen with the implications of science and of promoting cooperation between different disciplines, focusing their attention on common themes and problems.

Good value was also received in the field excursions planned by members of the University of Adelaide Geography Department. An ambitious plan for an excursion into the interior had to be abandoned, but the first trip acquainted visitors with Adelaide, while a second traversed the wheat, sheep, fruit and vineyard districts between Adelaide and Port Pirie, surveyed the Port Pirie lead, silver and zinc smelters, and Port Augusta on the desert fringe. The third excursion was a postcongress visit to Adelaide's carefully-planned new satellite city of Elizabeth and on to the Barossa Valley with its German settlements, vineyards and orchards. The generous hospitality of the Yalumba winery was quite obviously enjoyed. It would have been helpful had a full preliminary route-survey of the Port Augusta excursion been made, and a loosening of hurried schedules been made to permit more opportunities for visiting geographers to secure photographic records of the South Australian landscape. Important moves were made towards the formal establishment of an Institute of Australian Geographers, designed particularly for professionals; whilst South Pacific geographers became aware of each other's existence, discovered common problems and enjoyed the unstinted hospitality given by Dr Grenfell Price, the staff of the Adelaide Geography Department and the Royal Geographical Society of Australasia.

—G. R. Lewthwaite

MAORI POPULATION TRENDS. The 'Report of the Board of Maori Affairs' for the year ended 31 March 1958 (*Appendices to the Journals of the House of Representatives*, G-9) contains a competent and up-to-date analysis of Maori population trends. Of particular value is the second table, which summarises the census statistics for 1945, 1951 and 1956 in a compact and readable form. The grouping of counties and towns in regional blocks is helpful, though subdivision is necessary in the case of Northland and the East Coast, the northern and southern districts of which differ significantly in respect of density of Maori settlement, proportion of Maoris to Europeans, rate of rural emigration, and number of Maoris living in local towns.

The attempt to classify 'patterns of change' on a regional basis is not wholly satisfactory, but the major trends emerge clearly from the text as a whole. In addition to certain major towns, four regions are greatly affected by Maori population movement. The Far North and the northern East Coast are 'reservoir' areas which, since 1945 at least, have consistently lost surplus population to other regions. In contrast, the Waikato–King Country and Rotorua–Taupo–Bay of Plenty regions, where rural industries are expanding rapidly, have absorbed a large influx of Maori workers since 1951. The Maori populations of the other North Island regions show no comparable divergence from the rate of natural increase, and it is assumed that there is little migration in or out of them. This conclusion is unwarranted without more detailed knowledge than the statistics afford, since emigration and immigration might conceivably take place at roughly equal rates. Attention is drawn also to the beginnings of a most interesting movement towards the South Island and to the size and rapid increase of the Maori population of Christchurch.

Most of the relevant facts about Maori urbanisation are also set out clearly: the steady increase in the urban population of most areas at rates well above that of natural increase, the growing importance of the towns of the central plateau of the North Island, the decline in the rate of urban increase in the Far North, Taranaki, Wanganui–Manawatu and Wairarapa, and the dominance of Auckland. More emphasis could perhaps have been given to the remarkable concentration in a small number of larger urban areas. In 1956, 56.3 percent of the urban Maori population was to be found in seven centres: Auckland and Wellington—the largest and most highly industrialised cities in New Zealand; Rotorua and Gisborne—regional centres for rural areas with large Maori populations which were being swollen by immigrants from other regions; Hamilton and Hastings—growing cities in areas of predominantly European settlement; and Wanganui, which, however, had a low rate of Maori increase. All seven had more than 1,000 Maori residents, and together they accounted for 62.4 percent of the Maori urban increase between 1945 and 1956.

So is presented a clear picture of the facts, but the report does not enter very deeply into the social and economic implications. The general tendency towards 'diffusion from traditional areas of concentration into new situations' may be taken as true of urbanisation as well as of movement between rural areas. The overall effect has been to increase the amount and closeness of contact between Maori and pakeha, and also between members of different tribes, thus adding to the problems normally associated with rapid changes in population distribution, and with urbanisation especially. At the same time, it needs to be recognised that these changes are not only a *consequence* of the increasing integration of the Maori into the social and economic life of New Zealand as a whole, but themselves play an important part in advancing the process.—JOAN METGE

THE COLOMBO PLAN. New Zealand recognises her affiliations with South and Southeast Asia in a practical manner. Since the first operation of the Colombo Plan in 1950 she has, to June 1958, in one way or another spent seven million pounds in respect to the area covered by the plan. This is about twenty-seven percent of the amount spent in 1957 on defence in New Zealand.

Nearly a quarter of the world's population lives in South and Southeast Asia and the majority of the people are undernourished. By medical standards 2,800 calories per day are considered necessary, but men and women in the Colombo Plan area consume, on the average, less than 2,000 calories a day. The diet is one mainly of rice and pulses and is therefore deficient in fats. Thus, with more than 600 million people so close to New Zealand and so vulnerable to Communism, it would be prudent, even if it were not humane, for the dominion to take an interest in the wellbeing of this area.

The *Sixth Annual Report of the Consultative Committee on Economic Development in South and South-East Asia*, 1958, makes it clear that New Zealand's assistance is now both technical and monetary. In respect to the first, there are under training in this country four times as many Colombo Plan students as there were three years ago. The total number either training or observing since 1950 has reached 459. Moreover, seventy-two New Zealanders have been in Colombo Plan areas as experts on health, technical education, industry, commerce, agriculture and the social sciences. So far geographers, as such, have not been required.

The money from New Zealand has been spent largely in the following ways: more than £2 million have gone to India to help in the establishment of a medical institute and to sponsor the dairy industry; more than £1 million has been given to Ceylon, principally to aid the dry-farming research station and a tank irrigation scheme. Pakistan has received £1,400,000 for earth-moving equipment, a cement factory and a sugar mill, the last being situated in East Pakistan. Indonesia has been granted at least £335,000 to aid development of a Trade Training Centre. Lesser amounts have gone to Cambodia, Burma, Malaya and Thailand.

The advances in technology which the grants foster will all help to raise the standard of living, though this is a slow process. From a purely selfish point of view, in the long run, a rise in the standard of living in the Colombo Plan area is to the advantage of New Zealand. The amount of temperate-land agricultural products which these countries could then buy from New Zealand would no doubt increase; but to envisage a vast permanent potential market for dairy produce or meat is probably a big mistake. Each of the Colombo Plan countries has its own potential in these respects.

The goodwill engendered by the plan is, of course, not measurable. New Zealanders get on well abroad in Colombo Plan areas, whilst in this country the visiting students and trainees feel quite at home. The food and the climate do not appeal to them, of course, but they find New Zealand institutions and most of its customs very tolerable, and the attitude to them is friendly.

It would, however, be an error to imagine that the individual friendships made lead inevitably to good relations between governments, or that there is greater mutual understanding because of the opportunity of contact. It needs to be remembered, too, that the Colombo Plan students, on the whole, do not meet a cross-section of New Zealanders, but a restricted group, mainly professional. They do not, for the most part, live with New Zealand families, but are in hostels and other similar institutions.

Because, on the whole, South and Southeast Asia belong to that part of the world labelled underprivileged, too many New Zealanders are apt to forget that many of the students and observers who come here do in fact come from excellent, rich and elaborate homes; that some are from training centres far superior in equipment to those in New Zealand; and that many enjoy at home a way of life far more sophisticated than that which they find here.

The excellently clear report is full of statistical information, but of necessity it does not reveal the inner significances of the project, nor does it attempt to evaluate the success of the Colombo Plan in terms of human relationships or future political friendships.—A. M. Gorrie

IN OUR CONTEMPORARIES

1. *In New Zealand Journals . . .*

Farming in Taranaki

FARMING IN NEW ZEALAND: TARANAKI: A. C. Burgess, *N.Z. Journal of Agriculture*, Vol. 96, No. 4 April, No. 5 May, No. 6 June, 1958, pp. 369-386, 454-465, 531-536.

The first article in this series on farming in Taranaki provides a background of the physical geography of the area and traces the agricultural development and settlement of the dairying region of the lowlands, or 'ring plain'. The settlement of the back country and the rise of sheep farming form the second article, while the last describes the development of one dairy farm on the lowlands since 1938.

The physical account brings out clearly the essential difference between the broken, wet, back country with its skeletal soils, scrub and bush, and the more fertile undulating lowlands originally in forest except for coastal areas of fern and scrub.

Despite the early beginnings of white settlement in 1829, the agricultural development of Taranaki really started after the Maori Wars of 1860–1869 when soldiers, having finished their contracts in the coastal military settlements, were each given 50 acres of confiscated land. The construction of the north-south railway through the bush at this time provided a base for expansion. Contemporary writers, such as Thomas Kelly, give detailed and interesting accounts of the methods of clearing land, and Burgess quotes them at length.

In general the pattern involved felling of the bush from August to October and burning about February after a dry spell. In the ashes seed was sown in April, and this provided either grass seed or, within four months, feed for cattle. In 1887 the cost of purchasing, felling, grassing and fencing was given as from £4 to £5 per acre. However during the 1870's and 1880's it was in fact 'Taranaki wool' which kept the dairy farmers going. This 'wool' was the fungus that grew on certain native trees and which was prized as a vegetable delicacy in China. It was not until refrigeration proved a success that dairying came into its own, and hand in hand went the second stage of development—logging, stumping, ploughing and resowing.

Progress was still not easy. Between 1900 and 1925 the declining fertility of the lowland soils saw the spread of weeds and a movement of settlers off the land. The use of superphosphate was a partial counter, but blackberry and ragwort became major menaces and it was not until the late 1920's that ragwort began to be controlled by use of sodium chlorate.

By 1925 the all-grass farm was universal and since then trends have been towards the increased use of fertilisers, especially potash and phosphate, better grasses and clovers, increased mechanisation and more intensified grazing.

In contrast to the pattern of development in the lowlands, settlement in the back country preceded the roads, and access has always been a major difficulty. Settlers spent their time constructing roads and beating back second growth, many of them walking off their farms during the depression. Invaluable results of the widespread reversion to second growth were the field experiments and the series of articles by Bruce Levy in the *Journal of Agriculture* during the 1920's. These led to a better appreciation of the problems involved and methods needed to farm the land. Mr Burgess records the change from cattle to Romney-cross sheep and points out the importance of the flat tops ('terraces') as swede-growing areas. Only with the high prices for wool in the past decade and the advent of aerial topdressing has the spreading of fertiliser become important, and the face of the uplands has begun to change. With the present economic climate the future of this problem area is again uncertain.

The concluding article, which describes the changes on a 113-acre Inglewood dairy farm over the last twenty years, cites a representative example. From thirty-two cows in 1938 the herd has grown to sixty-five cows in 1956–1957, in addition to pigs and sheep, while butterfat production per acre has risen by 130 percent. It is a pity that the early development of this farm is not recorded. Likewise no attention is given to present farming problems that have come into prominence, for example, facial eczema and bloat.

Nevertheless the articles provide a valuable contribution to the general series on the major farming districts of New Zealand and are well illustrated with maps and photographs. The quotations in the historical sections from contemporary writers are apt and worthy of commendation.—W. B. JOHNSTON

ORCHARDING IN CANTERBURY AND AUCKLAND

HISTORY OF FRUITGROWING IN CANTERBURY: S. Frew, *N.Z. Journal of Agriculture*, Vol. 96, No. 5, May 1958, pp. 473-485.

DEVELOPMENT OF FRUITGROWING IN THE AUCKLAND DISTRICT: F. L. Bailey, *ibid.*, Vol. 96, No. 6, June 1958, pp. 583-591.

The 17,000 acres of producing orchards in New Zealand are scattered widely from the north of Northland to Central Otago. These two articles outline the historical development of fruit growing in Canterbury and Auckland, the two orcharding areas in New Zealand which are located nearest to large domestic markets and which show the greatest diversity of fruit produced. The Auckland article suffers from the lack of a map while some of the maps in the Canterbury article do little credit to the *Journal of Agriculture*.

Mr Frew suggests that Canterbury was the pioneer fruit-growing province of New Zealand, several commercial orchards being established before 1860 at Papanui and at the head of Lyttelton Harbour. His article traces the spread of orchards in many parts of the province until, in the early 1890's, there were some 1,700 orchards, more than half of them being of less than one acre and most of them sidelines to other forms of farming. Disease was rife and pruning spasmodic. Disease-control legislation in 1908 paved the way for rapid commercial expansion. Mr. Frew describes the planting boom of the decade 1910-1920 which raised the orchard area to 2,600 acres by 1925 and established the specialised fruitgrowing areas of Rangiora, Waimate and the Port Hills. Overspeculation brought retribution in the 1930's and the orchard area in Canterbury today is about one thousand acres—less than at the beginning of this century, although quality and volume of production are now vastly superior.

In the Auckland district climatic conditions prevent the growing of some fruits such as raspberries, currants, cherries and apricots which are important in Canterbury, but on the other hand they favour citrus fruits and grapes as well as apples, pears and peaches. Mr Bailey's article traces the development of orcharding from the first recorded commercial planting at Warkworth, forty miles north of Auckland, in the 1870's. Until the first World War most development took place on unsuitable gumland soils in Rodney county, on the shores of Kaipara Harbour, but this area now contains only two percent of the Auckland district's acreage. After 1918 more extensive planting took place nearer Auckland, at Henderson and on the North Shore, many of the orchards being taken up by Yugoslavs who were formerly kauri-gum diggers. Among the distinctive local features treated in this article are the problems of drainage in the prevalent clay subsoils, the role of strawberry growing and grape cultivation, and the widespread destruction or neglect of apple and lemon orchards because of marketing difficulties during the second World War. There are now some 3,800 acres in fruit trees in the Auckland district, including 500 acres in citrus fruits and 500 acres in grapevines. Current trends include a decline in the pip-fruit acreage, an expansion of stone fruit, the growth of subtropical fruits such as tree tomatoes and Chinese gooseberries, and the increase of vineyards.

In both Canterbury and Auckland proximity to large urban markets has encouraged the planting of a variety of fruit trees on the one orchard in contrast to the relative specialisation of the Hastings, Nelson and Central Otago districts. Yet the sprawling cities which have given the fruitgrower the stimulus of handy markets are now encroaching on to many of the older-established orchards. This threat is touched on by both authors but it would seem to demand urgent and detailed examination if local supplies of fruit are to be maintained for expanding city populations.

—Murray McCaskill

2. *In Oversea Journals . . .*

Continental Drift and Biogeography

THE BIOGEOGRAPHY OF AUSTRALIA: Ronald Good, *Nature*, Vol. 181, 1958, pp. 1763-1765.

The relationships of the Australian and New Zealand floras to other floras has exercised the minds of botanists since the time of Sir Joseph Hooker. In particular, the affinity between the South African and Australian flora has presented a major problem. The two classical interpretations of plant migration involve either oceanic dispersal or dispersal by land bridges. The Indian Ocean represents a major water barrier for seed transport, whether it be by ocean currents, wind or birds. Geologists have postulated an ancient continent, Gondwanaland, which in Carboniferous times united, by means of land bridges, Australia, South Africa, South America and Antarctica. The characteristic nature of much of the Australian flora and the absence of specialised desert types indicates that any break-up of Gondwanaland must have been not earlier than the late Jurassic, and probably not later than the middle of the Cretaceous, when the land bridges are regarded as having disappeared.

Professor Good, however, accepts neither of the above hypotheses. He pins his faith to the theory of continental drift. He accepts Du Toit's modification of Wegener's original hypothesis, which gives a southerly location for Australia and South Africa in the continent of Gondwanaland. During the time this continent existed, the Angiosperms were evolving rapidly, but the climate was a temperate rainforest one leading to the kind of lowland warm temperate forest found in New Zealand today, typified by predominance of Podocarps and circumantarctic plants. Drift northwards and separation from South Africa must have started in the Cretaceous after the common families had spread, but before the elements of the African arid zone could become established. During the northward migration, Australia passed into the arid zone and also approached the New Guinea arc, which enabled invasion of Indo-Malayan species to take place.

The hypothesis and the arguments in support of it produced by Professor Good are indeed plausible. It is noteworthy that at present the strongest adherents of continental drift are to be found among plant and animal geographers, largely because there are many problems of distribution most satisfactorily explained by the hypothesis. Geologists, on the other hand, do not give general support to continental drift, and favour instead the development of land bridges.

The contribution made by Professor Good is of particular interest also to students of the New Zealand flora where the problem is comparable. If continental drift is the correct explanation for Australian biogeographical affinities, then the hypothesis must also be of significance in interpreting New Zealand biogeographical affinities. In conclusion, it may be suggested that further evidence either for or against Professor Good's theory will come from increased study of the floras of Cretaceous and early Tertiary rocks in Australia.—V. J. Chapman

The Structure of the Pacific Girdle

THE RIM OF THE PACIFIC: C. A. Cotton, *Geographical Journal*, Vol. 124, Part 2, June 1958, pp. 223-231.

Professor Cotton discusses the border of the largest single unit on the earth's surface. The Pacific Ocean basin is defined by the basaltic nature of its floor, which is reflected in the Hawaian type of vulcanicity characteristic of this zone; this contrasts with the more explosive type of volcanic eruption found outside the andesite line which defines the limit of the basin. The distinction in the type of volcanic eruption has led to the suggestion that the andesite line may run under the gravels of the Canterbury Plains, thus including the basalt volcanoes of Banks Peninsula in the Pacific basin.

Professor Cotton points out that this border zone differs markedly from place to place, but he suggests that certain areas, such as New Zealand, California and Japan, show remarkable similarities in structure and earth movements. A more detailed comparison of the two former areas shows that both contain thick folded marine sediments, resulting from the folding in much earlier earth movements, as well as zones of block faulting and large-scale transcurrent movements along fault lines of a much more recent date. The San Andreas rift of California may be compared with the Alpine fault of New Zealand; both reflect the action of deep-seated crustal forces which cause lateral movement. The block faulting, closely associated with these faults, probably represents the surface expression of the subcrustal movements. In New Zealand the range and basin country of Central Otago and northwest Nelson illustrates this effect; broader buckling and associated downwarping may be responsible for the drowning of the Marlborough Sounds area. The analogous features in California include the Coastal and Transverse Ranges. In extending the analogy, the Tasman Sea is compared with the Great Valley of California and the interior of western North America with eastern Australia. The similarities are considerable, although the elevations are greater in America.

In both these areas land has recently been elevated which is, in part, composed of very young marine strata, although older folded strata have also been elevated, as in the Southern Alps. Structurally, as well as in relief forms, the two areas have much in common. The relation between the early folding and the modern movements is not always clear, and occasional periods of quiescence are demonstrated by peneplanation in New Zealand. It is possible that transverse thrusting has been replaced by tangential drift, although the two processes may not be strictly differentiated in time.

In this article Professor Cotton stresses the unity of the Pacific Ocean basin and its rim by pointing out the striking similarities in New Zealand and California at opposite ends of a 7,000-mile diameter across the basin.—C. A. M. KING

PACIFIC ISLAND AGRICULTURE

CHANGING VILLAGE AGRICULTURE IN WESTERN SAMOA: J. H. Mercer and Peter Scott, *Geographical Journal*, Vol. 124, Pt. 3, September 1958, pp. 347-360.

There is little geographical material published about the islands of the South Pacific, and so when a study is published, and this on an island group so closely connected with New Zealand as Western Samoa, it is most welcome. Some results of Dr Mercer's six months' fieldwork are presented in a discussion of two villages: Luatuanu'u in Upolu and Vaisala in Savai'i. Each village is considered separately, and the description is accompanied by maps showing crop combinations and age of clearings. For Vaisala a map called 'land ownership' is also included. The maps are the most useful part of the paper and one who has undertaken fieldwork in Western Samoa cannot but be impressed with the exactitude with which *primary* and *secondary* forests have been differentiated and mapped.

An interesting table shows the disposition of crops among the lands of *aiga* from Vaisala. Unfortunately no indication is given as to how these acreages compared with other parts of Western Samoa, and no analysis appears of Luatuanu'u land for comparison. Nor is there any mention of the number of persons in each *aiga* so that an assessment of the per capita acreage may be made and, for that matter, so that comparison may be made with areas outside Western Samoa.

A few changes that have taken place since Dr Mercer did his work have not been noted, but these are relatively minor. As an introduction to some aspects of Samoan agriculture the paper is useful, but what might have been the major contribution, the presentation of new and original material from first-hand fieldwork, receives too little emphasis and little interpretation. General information, much of which is obtainable elsewhere, receives relatively more attention.

Finally, detailed studies of many villages are fundamental to the extension of knowledge about Samoan agriculture and their value cannot be disputed, but to entitle a paper, 'Changing Village Agriculture in Western Samoa', on the basis of a study of two atypical villages without considerable qualification is questionable. However, if the shortcomings are understood first, much of value can be learned from this paper.—B. H. Farrell

Population Communities

THE AGE STRUCTURE OF NEW ZEALAND'S NORTH ISLAND COMMUNITIES: S. H. Franklin, *Economic Geography*, Vol. 34, No. 1, January 1958, pp. 64-79.

The population pyramid is by now a well-known method of illustrating the age structure of a country's population, and of emphasising contrasts between communities with different demographic histories, for example, Maoris and Europeans in New Zealand. However, when the communities to be compared are essentially similar, the pyramid device is of limited value in illustrating differences, which, though slight, may nevertheless be significant. In his analysis of the age data provided by the 1951 census, Mr Franklin has preferred to use divergence graphs, which take the national average proportion in each age group as a base (= 100) and show the composition of particular communities as sets of indices of the national averages. Thus, rural Taranaki, a dairy farming community, has a divergence graph running from over 120 for children down to less than 60 for old people, the corresponding regional and national percentages being as follows: under 15 years, 35.6 and 29.3; 65 years and over, 5.5 and 9.2. Undoubtedly, departures from the mean of this magnitude are both statistically significant and geographically important.

Mr Franklin has examined the age structures of the several 'communities' into which, he claims, New Zealanders can be divided—rural and urban; Maori and European; small town, provincial city and metropolitan; pioneer rural, dairying and sheep farming. He also points out differences in the ratio of males to females in each age group. In short, not only is the population, in the classic phrase, 'broken down by age and sex', but also by domicile, race and occupation. He finds that the major variations in age structure are to be seen in the proportion of children and the proportion of retired people. This reflects two well-known tendencies: for farmers' families to be larger than those of town dwellers and for farmers to move into town on retirement. Mr Franklin's graphs suggest that these trends can be stated more precisely: that sheep farming communities, for example, have relatively fewer children and more old people than have dairying districts; and that the Wellington and Hutt urban areas have relatively fewer old people than Auckland or the provincial cities of the North Island.

Another strong internal migration is that of young, single women into the cities, thus producing the much-publicised surplus of bachelors in the country and the corresponding surplus of spinsters in the town. The divergence graphs bring out these disparities very clearly, and Mr Franklin analyses their social background.

To the geographer perhaps the most interesting contrasts are those between the age structures of the different regions of the North Island. Mr Franklin distinguishes between the 'urban fringe' areas around Auckland and Wellington; the 'pioneer' communities of the Central Plateau and the Western Uplands; the dairying districts of Taranaki and South Auckland; and the sheep farming communities of Rangitikei, Wairarapa, East Cape, Hawkes Bay and Manawatu. Not surprisingly, two regions fail to fit comfortably into any of these rather arbitrary groups: Northland, because of its diversity, and Cape Colville because, one suspects, its population is too small to be statistically reliable.

Indeed, considering their very diverse settlement histories, it is remarkable that the other regions should conform so well to type. Many parts of the North Island have been settled by Europeans within the lifetime of those who were over 65 in 1951, that is, since 1886. By 1906, on the other hand, districts like Taranaki and the Manawatu were passing out of the pioneering phase, and the grown sons of the older settlers were going off to take up land in the Waikato. In 1951, the Manawatu had 18.7 percent of its people aged 45-65 and 8.0 percent over 65; the corresponding figures for Taranaki, 15.9 and 5.5, were more like those for South Auckland, or even the Western Uplands, than like those for Manawatu. Mr Franklin argues convincingly that dairying, with its 'exacting seven-day-a-week' schedule, and typically small family farms, 'demands a somewhat younger labour force' than does sheep farming, where a middle-aged man can concentrate on management and leave the heavy work to contractors.

In his conclusion, Mr Franklin suggests that, 'in a sense, the population of New Zealand may be divided into two groups, the first, the male population between 15-65, the second, the remainder'. While the distribution of working males depends on the location of economic activity and opportunity, that of women, of children and of retired people is largely independent of economic factors. One would like to have seen this important differentiation carried to its logical conclusion, namely, the plotting of population distribution maps, perhaps of the 'mille' type, for each of these sections of the community.—J. S. DUNCAN

REVIEWS

A Geography of New Zealand Climate

THE CLIMATE OF NEW ZEALAND. By B. J. Garnier. London: Edward Arnold Ltd., 1958, pp. 191, 70s.

When Professor Garnier left New Zealand eight years ago to take up the Chair of Geography at Ibadan he had behind him a considerable amount of published work on New Zealand climate; in particular, the problem of climatic classification. He has now provided this welcome book whose subtitle 'A Geographic Survey', indicates the way it is organised. He attempts to relate the climatic conditions and weather sequences of various parts of New Zealand with other associated geographic features—soils, vegetation, farming and human comfort. This is truly the approach of the geographer, an approach which makes his work at once more difficult than that of the pure meteorologist, and the more rewarding.

In the first fifty pages the author gives an introduction to the climate of New Zealand in general terms and then proceeds to link the factors involved to the country's world location and physical character. The remaining hundred pages of the body of the book are given to a study of the nine climatic regions into which he divides New Zealand. Then follow thirty pages of tables, select bibliography and index. The regional study is then the basis of the work.

Though much of Professor Garnier's work in the past has been concerned with the 1931 and 1948 Thornthwaite climatic classifications, he very wisely abandons these and divides New Zealand empirically into nine regions based on the variation and grouping of the climatic factors, factors which are the ones normally encountered in weather study, and not those of Thornthwaite, which are thoroughly grasped only by the specialist. For his regions the author has a list of letters whose association describes the climate of the area, such as 'T' for 'subtropical influences marked from time to time'. This is an excellent way of referring to the variety of factors in New Zealand but it is unfortunate that 'A' stands for what is called 'Antarctic influences . . . particularly marked' when all that is meant is that cold southerly conditions are common. Any air masses of Antarctic origin have undergone much modification before they reach New Zealand.

It is interesting to compare this empirical classification with that of Mr N. G. Robertson, Climatologist of the Meteorological Office, published in the somewhat inaccessible *Proceedings of the N.Z. Ecological Society*, No. 4, 1956. They agree very well, though Robertson gives some division of regions not quite on the same lines as Garnier.

The strength of the book lies in the detailed study of the regions, and in this connection there is one important thing that must be said: anyone who has taught New Zealand geography for long will find here things he has been saying for years, but Professor Garnier is the first one who has said them in print, and the first one who has tried to connect the complex factors involved in climatic response in a form available for readers overseas. The descriptions are generally very sound and are documented by tables of climatic elements, and sample synoptic charts, and the author brings out very clearly the complex mosaic of New Zealand climate particularly in relation to its physical features. The synoptic charts, however, are from the daily working charts of the Meteorological Office, and have not been reanalysed.

In his introduction Professor Garnier stresses that climatic information does not become out of date, and that work done between 1945 and 1951 is still valid. This is true, but is only part of the picture, for many things have happened to the New Zealand landscape he describes since he last saw it, and it is most disappointing to find him, for example, describing the Central Otago landscape as 'whole hillsides "moving" with rabbits . . . . . rows of rabbit carcases hung out along the fences, and the regular arrival of the "rabbit cart",' when such a dramatic change has taken place in the position of the rabbit in New Zealand. Many important papers on the relations of vegetation and soils, too, have appeared which would greatly have helped the total picture of the landscape of the climatic regions. In particular the paper by N. H. Taylor and J. E. Cox, 'The Soil Pattern of New Zealand', *Soil Bureau Publication No. 113*, 1956, should have transformed the reference to soils in the book and rendered redundant many of the somewhat irrelevant maps of soils. There are many places in the book where it is obvious that had Professor Garnier had his manuscript read in this country the small inevitable errors would have been eliminated: east of the Manawatu Gorge, scarps face the opposite way to that described; the impression of erosion carving the country from a Pliocene orogeny could have been corrected; and Dr McLintock, once an associate of Professor Garnier's, could have been protected from having his name spelt two different ways, both of them wrong.

The tragedy of the book is its cost. Its make-up is lavish to the point of senselessness. It has a large page with very ample margins and nearly all of the many diagrams occupy a quite disproportionate amount of space; on page after page a map occupies the whole space when it would have been quite satisfactory in a quarter of the area. There are seventeen large halftone blocks, many of them in this reviewer's opinion irrelevant, and one of them very badly astray. This is Plate VII, 'The Diversity of Eastern North Island', which has a view called 'near Blenheim' which is actually a most characteristic photograph of Wakefield and the Moutere gravels. It is the high cost of the book, the result of bad format, which will undoubtedly limit the use which it should have in the hands of secondary-school teachers in particular. They would have found it a mine of information on much wider topics than its title would lead one to expect.

In a land whose greatest agricultural asset is its climate this study emphasises the fact that the geographer in particular offers a unique viewpoint which can integrate man and his activities into the physical pattern of the world he lives in. Professor Garnier is too modest in his apology for having as a geographer produced this work; it essentially is his business, which no one else will do for him.—D. W. McKenzie

The 'New Look' of 'The University Atlas'

THE UNIVERSITY ATLAS. Edited by Harold Fullard and H. C. Darby. London: George Philip and Son, 1958, pp. 176, 30s.

This well-known atlas was first published in 1937; its eighth edition is so different as to appear to be a new atlas were it not that the plan is almost identical. The most obvious change is in size; instead of being fifteen inches by eleven inches, it is now eleven and a quarter by nine inches, and one had only to use the atlas for a few minutes to realise that, other things being equal, this is an enormous advantage. The new edition not only incorporates many changes and developments of recent years, but it is technically much improved and the maps generally have a more attractive appearance. The layer colouring is more pleasing, the lettering has been largely changed and in general does not obtrude unduly, yet is clear and satisfying. Some of the sectional maps, e.g. those of New Zealand and of the Union of South Africa, are on larger scales than hitherto. Most of the former special maps have been retained; new features include maps of the Atlantic and Pacific Oceans, the representation of major roads and airports and a useful list of place names that have been changed or that have alternative forms. The climatic graphs and index have been thoroughly revised.

Some of the large, bold maps of earlier editions may well be missed in addition to certain special maps and the introductory notes on the projections used. The new size is not without its drawbacks: thus, the sectional maps of Great Britain formerly occupied seven pages; on the same scale, 1 : 1,000,000, the new ones need ten pages. Difficulties connected with a prolonged production period doubtless account for such details as that of the railway through Sinkiang on page 111 being shown, correctly, as more advanced than on the general map of Asia on page 105. Population maps are now assigned to the relevant parts of the atlas; that of the United States brings out well the much increased population of the Pacific slope but that of Africa does far from justice to the density of population in the region of Lake Victoria. Indeed, there are serious discrepancies between these two maps, especially that of Africa, and those of the corresponding areas on the world population map on pages eight and nine.

New Zealand receives much better treatment than in earlier editions; instead of being tucked away in less than half a page, the North and South Islands are now each given a page and shown in much more detail. The inset map described as 'Political' in fact is a map of the land districts, these areas having no political significance.

On the whole, the 'new look' of this atlas is very satisfying. The redesigning and revision have, for the most part, been thoroughly and competently done and the student of geography will be well served should he have this atlas available to aid him in his work.—L. S. Suggate

An Inventory of Early Maps

MAPS OF CANTERBURY AND THE WEST COAST: A Selected Bibliography. Christchurch: Canterbury Branch, New Zealand Geographical Society, 1958, pp. 49 (mimeographed), 12s. 6d.

The importance, which was attached, in New Zealand's first century of organised European settlement, to the accurate demarcation and plotting of land-subdivision boundaries as a guarantee of the sanctity of title to ownership of land was the greatest single deterrent to the compilation of a systematic series of topographic maps. Had such topographic maps been produced, readily accessible copies of them would exist today and research into the geography of the immediate past would be much simplified. Maps were produced, and accurate maps too, by pioneer surveyors of skill and fortitude, but they were mainly cadastral maps, the peg-positions and straight-line boundaries of which across rugged terrain gave at best an inadequate picture of the total character of the areas traversed. Such significant cultural detail as was shown was usually incidental—often, indeed, accidental.

As a clear guide to the worker attempting to locate those of the older maps which do provide valuable clues to the past, the three hundred and more references contained in this mimeographed booklet will prove extremely valuable. Many maps previously filed away into oblivion, or the existence of which was even totally unrecognised, are listed. Particularly is this so with some of the early French maps of Banks Peninsula.

The modest format tends to conceal the very considerable labours of searching, evaluation, selection, cross-checking and compilation that are its basis. Mr Ross, the Canterbury Branch Map Bibliography Committee, and all who helped to bring maps to their notice have placed workers in several fields, but especially geographers, heavily in their debt. Their accomplishment should lend encouragement to the early extension of this map bibliography to provide total New Zealand and South Pacific coverage.

One possible criticism of this present production is that the format of the individual references could have been more compact and readily amenable to dissection and mounting on standard library-index cards. But this is a very minor criticism of a major initial contribution.—STEWART CAMERON

A SYSTEMATIC APPROACH TO NEW ZEALAND GEOGRAPHY

MAN, MAP AND LANDSCAPE IN NEW ZEALAND. By D. W. McKenzie. Wellington: A. H. and A. W. Reed, 1958. Book I: *Man, Map and Landscape (Taranaki)*, pp. 24, 3s. Book II: *The Build of New Zealand*, pp. 32, 3s. 6d. Book III: *Climate in New Zealand*, pp. 24, 3s.

These three booklets are the first of a series which aims to present a geography of New Zealand at the post-primary level. In all, twelve booklets with three associated work-books are planned. The author states that while material on a regional approach to New Zealand geography is readily available, and widely used, the neglect of complementary systematic studies due to lack of source material is the reason for publishing the present series. The above titles, together with forthcoming ones such as *Land, Sea and Port*, and *Power in New Zealand* give some guide to the material presented.

Book I makes a detailed study of the landscape of the Stratford sheet (N. 119) of N.Z.M.S. I. on the scale 1:63,360. Two methods of approach are suggested. Pupils could make a detailed study of small areas by using the black and white map extracts together with vertical air photographs. Once the difference in scale is mastered, the simple interpretation of these photographs will be rewarding and serve as a necessary reminder of the reality behind the map symbols. Included in this section, however, is a map of soils of the Stratford area, the inference being that the information is entirely obtained from map analysis, an unfortunate impression to convey to pupils. Teachers should note that all the photographs and maps of this booklet are now incorporated in a filmstrip 'The Stratford Sheet N. 119' obtainable from the

National Film Library. In this form the photographs can be used with greater flexibility, whether in association with the booklet or the topographic sheet.

In *The Build of New Zealand* a detailed study is made of the southern part of the North Island by the use of block diagrams and photographs. The rest of the booklet is mainly concerned with a very brief survey of the landform characteristics of the eight divisions used to cover the remainder of the country. Some forty photographs are included. *Climate in New Zealand* considers in some detail the sequence of weather associated with the passage of a depression, then follows a series of climatic isopleths and a new division of New Zealand into climatic regions.

The teacher must decide at what level a new set of books would be suitable to his classes. In the author's words, the series has been 'so designed that the teacher can build a realistic knowledge of New Zealand geography by using them at whatever stage in post-primary work he wishes'. Some teachers will value this flexibility, but probably more would prefer an even standard of presentation to suit a particular class. The standard of difficulty certainly varies within the one booklet, for some of the climatic material could be used with juniors while the analysis of depressions would be more appropriate to lower or even upper sixth forms. The brevity of explanation given to technical terms and to some of the more complex issues raised in this booklet further restricts its use to senior forms. Senior pupils would be better equipped to examine critically such a statement as 'more than anything else it was the climate that determined in which direction New Zealand was to develop'.

The hard-pressed teacher of the school certificate geography syllabus may look in the workbooks for exercises. Here the author has made a plea for annotated sketch maps and to this end base maps giving a too-detailed pattern of rivers are provided. Further guidance in sketch-map construction could well have been included here. In the workbook section on climate, however, further new material is introduced and useful exercises suggested.

For this reviewer, however, the greatest value of the series is in the variety of photographs, clearly printed and made available at a modest price.—T. E. French

A Sixth-Form Textbook

AN INTRODUCTION TO ADVANCED GEOGRAPHY. By E. W. H. Briault and J. H. Hubbard. London: Longmans, Green and Co. Ltd., 1957, pp. 470, 24s.

Many senior schoolteachers in New Zealand are at present somewhat at a loss to find suitable textbooks for the new prescriptions in University Entrance and University Scholarships Examinations. This book should at least provide a solution for many of the problems, in particular those arising from the paper in systematic physical geography. However, it must be supplemented by New Zealand examples, for the book is aimed at sixth-form work in Great Britain.

Of necessity the treatment is general: 130 pages are devoted to landforms, 56 to weather and climate, 38 to biogeography, 92 to economic geography, and 56 to population and settlement. In addition, 62 pages are given over to a study of maps, but this section would be better covered in those textbooks designed specifically to deal with this topic. Finally there are three interesting chapters on the history and the content of geography. These suffer from the condensation which has been necessary, but they do provide a background for the student who is to proceed to university studies, and it is noteworthy that such chapters now find their place in a British sixth-form textbook, for they are symptomatic of the critical attitudes—or the fashions—that have developed during the last twenty years.

In any case, these chapters, and the book as a whole, give some indication of standards in geography now expected and being attained in most schools in Great Britain—twenty years ago these standards were characteristic of but a few schools—and as such it provides a challenge for teachers of geography in New Zealand.

—James W. Fox

Introduction to Cultural Geography

WORLD GEOGRAPHY—HUMAN. By L. S. Suggate. London: Thomas Nelson and Sons, 1958, pp. 326, 12s. 6d.

This book is a comprehensive study of the world's resources and of the use that man makes of them. In many respects it is a secondary-school counterpart of Jones and Darkenwald: *Economic Geography*. The longest of the eleven chapters, 'Some Modes of Life', ranges from hunting and collecting through nomadic pastoralism to manufacturing industry and commerce. In each section of this chapter the author starts with a unit study such as the Kalahari Bushman, or the Ruhr industrial region, and then goes on to the broader world pattern. The other chapters deal with world population, food resources, raw materials, minerals, fuel and power, manufacturing industry, transport and communications, settlements and urbanisation, political geography, and the changing world.

The chapter on political geography includes topics such as the Arab League, plans for cooperation in Western Europe, conflicting ideologies, colonisation and nationalism, and NATO and SEATO, which are often included in the programme for fourth-form social studies and school certificate history.

There are almost one hundred photographs. These are an excellent aid to the text, and cover recent developments in many parts of the world, including the spectacular Kitimat project in British Columbia and a unique view of the North Pole region. While one should not cavil at the seventy-six maps which are clearly drawn and contain only relevant details, it is a pity that statistical diagrams were not included.

For the primary-school teacher the book deals with the world patterns which are featured in the present (1957) syllabus for Forms I and II, and which tie together the separate threads and unit studies taken lower down in the school. For the post-primary teacher endeavouring to plan a worthwhile course in social studies for his third and fourth forms this book should prove a valuable asset in that it provides a sound geographic background for the study of people, their numbers and distribution, what they are like, what work they do and how they are organised in different parts of the world.

In fact, one cannot help feeling that if the majority of post-primary pupils, who have no intention of going on to become academic geographers, could know something of the contents of this book they would be far better equipped to face the world than with their modern version of 'capes and bays'—the learning of lists of characteristics of regions in New Zealand and the British Isles, or the parts of lists that can be shown on the appropriate topographic sheets—a practice that must dismay advocates of regional geography.—C. M. Herbert

An American Example

NATIONAL ATLAS OF THE UNITED STATES. The National Research Council and the National Academy of Sciences, Washington, 1956.

Exploitation of the cartographic medium does not always prosper under conditions of over-rigid standardisation. Several ambitious projects of the past have passed into sterile oblivion through their sponsors' inability to recognise this. On the other hand, every geographer at some time has experienced time-wasting frustration in trying to correlate maps portraying the several characteristics of the same area which have been produced by different agencies using divergent scales and projections and conflicting methods of cartographic representation.

The committee responsible for the policy of the National Atlas of the United States has by many years of consultation, planning and debate tried to arrive at a workable compromise between the two extremes. The fifty-eight sheets so far published suggest that the final formula is a happy one. The atlas is a loose-leaf one with a sheet size of twenty-two inches by sixteen inches. This format makes for convenient desk use and allows the optional presentation of one map of the United States at a scale of 1:10,000,000, four maps at 1:20,000,000 or nine maps at 1:30,000,000. Its ultimate success depends on the degree to which the various map publishing authorities, principally, but not exclusively, government research and service agencies, are willing to produce maps conforming to the prescribed specifications. The United States Geological Survey is the coordinating body. To date, contributors are the Weather Bureau, the Bureau of the Census, the Soil Conservation Service, the Department of Agriculture and the Geological Survey.

The offering of the Bureau of the Census is the most substantial, consisting not only of a population distribution map but also of a series of forty-one sheets carrying a total of 272 maps and forty-three graphs and a total of over 200,000 words of explanatory text and tables on their reverse sides. This series collectively gives an extremely comprehensive picture of United States agriculture. The material mapped ranges from accessory information such as the percentage of farms possessing television sets, telephones, piped water and electric power to such broadly significant phenomena as the change in harvested acreage of principal crops over the 1949–1954 period. All maps are clear and severely functional and, to keep unit costs low, colour is used sparingly. The very useful specification is that each map must bear both its Dewey Decimal and its Library of Congress classification. The National Atlas of the United States combines comprehensiveness and uniformity with simplicity and flexibility and embodies many principles and features which merit adoption in New Zealand.—Stewart Cameron

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